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EDITORIAL NOTES.

The London County Council and the Gas Supply of London—A Fresh Project of Legislation.

THE important announcement that appears in another column relating to the legislative intentions of the London County Council in regard to the resettlement of the gas question of the Metropolis, will be received with mixed feelings by those who are responsible for the administration of so much of the gas industry of this country as still remains the property of Companies. It is not saying too much to declare that it puts into the background all the other gas intelligence of the day. It has been a subject of conversation among outside observers of the proceedings of the Gaslight and Coke Company as to whether or not the Company would find it necessary to go to Parliament next session. All doubt upon the point of the expediency of such action is effectually disposed of by the news that the London County Council intend to ask Parliament to legislate for the Company, according to their own views of what is right and proper in the circumstances. It will be absolutely necessary for the Company to meet this demand not merely with opposition, but also with an alternative scheme of legislation for the future of this great undertaking. It is idle to speculate upon what might have happened if the administration of the Company had taken from the first a different line in regard to the report of Sir James Rankin's Committee. That is all in the past. For the time being, it is only worth considering that the County Council propose in the first place to obtain the reduction of the Company's present standard price of 3s. 9d. per 1000 cubic feet to 3s. 3d., coupled with the supplementary sliding-scale giving an extra reward for cheapened gas which was so remarkable a feature of the recommendations of the Powers of Charge Committee. Secondly, it is proposed to make the Company redeem obsolete capital out of profits available for dividend. As to this, the concession already granted by the Company will probably be posed as yielding the principle; but what will really be fought over on this ground is the husbandry of the Directors during the past twenty-five years. Thirdly, the County Council will themselves ask for a reduction of the standard illuminating power of the Company's gas from 16 to 14 candles, with an equivalent reduction of the standard price. As to what the amount of the equivalent should be, there will clearly be a conflict of opinion. In connection with the question of illuminating power, the County Council return to the charge which they delivered this session against the improved use of the legal burner for testing. The last is the question of most widely-spread interest, and it will be prudent to refrain from hypothetical criticisms of what the County Council may be trying for until their case is more fully disclosed. For the present, it is sufficient to note that they propose to endeavour to repeal section 6 of the South Metropolitan Gas Act of 1900, and leave the Gas Referees to prescribe the method of testing the Company's gas.

Technical Education and Examinations.

THE subject of Education is very much with us at the present time, when Parliament is busily engaged in endeavouring to bring some sort of order into the national school systems of the country which are supported out of public funds. Meanwhile, most of those hard-working and thoughtful persons who are concerned for the secondary education of young people in the matters that concern their adopted callings, are not at all satisfied with the turn that so-called technical instruction has taken in many prominent cases. Owing to the withdrawal of the facilities for obtaining the necessary information which we, in common with other technical publications, formerly enjoyed by the co-operation of the authorities of the City and Guilds of London Institute, it is now impossible to give the publicity of the "JOURNAL" columns to the names of the successful candidates in the examinations in Gas Manufacture. It has been decided by the authorities of the Institute to issue the pass-lists for the future, not according to the subjects, but by the number of the candidates presenting themselves at the different centres. This may be all very well as an advertisement of the schools or centres, and of the Institute itself; but it deprives the passmen of the additional reward which would be so valuable to them if they meant to follow gas for a living. This reflection raises once more the whole question of the connection of these teaching centres and examinations with the pursuit of the callings identified with the various technics of which the Institute takes cognizance. Are the men who take up "Gas Manufacture" as a subject of examination with a view to getting a technological certificate, chiefly or largely men who live by the gas industry; or are they mere pupil teachers beating up "qualifications"?

The gas industry is not the only one which is exercised over the possible discrepancy between those who "qualify" in the scholastic sense for distinction in its ranks, and those who do the work. It is, notoriously, worse with electrical engineering, which is being sadly overdone in this way. The Institution of Electrical Engineers added 538 to their roll of membership last year. Well may those already in the profession cry out that there are not nearly enough plums for all the thumbs of the Jack Horners who are prying in this attractive pie. The order of electrical engineers who are really deserving of the classification, inasmuch as they are the counterparts of gas engineers and managers, are the station electrical engineers in the local service of companies and local authorities. In rare instances, as a writer in an electrical journal admits, the remuneration for these posts is reasonably good; but, as a rule, the pay is wholly inadequate, and the conditions far from satisfactory. The graveness of the complaint against the technical instruction classes which are going on in different parts of the country is that they attract into these "genteel" kinds of technic a mass of utterly unsuitable aspirants, many of whom would be far better off as bricklayers. This is the real source of the weakness of the candidates in elementary school subjects, drawing, and the art of expressing themselves orally and upon paper, which examiners of technical students everywhere complain of. The lads are not of the right class; but it is useless to say so in the ears of the democratic bodies who pay for their technical instruction. The hackneyed cry for "a career open to talent" is dangerous claptrap when it ignores all that should accompany mere cleverness, if the career is to be fairly merited, and sustained all through the relations of life touched by it.

The Limitation of Municipal Borrowing.

THE wail of ambitious and "progressive" municipalities over the restrictions which the law places upon their enterprise, finds concrete expression in a report which the Town Clerk of Plymouth has submitted to the Finance Committee of the borough. With an utterly reckless disregard for the future, Plymouth has gone on piling up debt until it has suddenly awoke to the consciousness that it can borrow no more for sanitary purposes because it has reached the limit defined by the Public Health Act of a debt equal to two years' assessable value of the borough. As there are many schemes which the Corporation still want to carry out, they have appealed to the Town Clerk to discover the means of relieving them from their financial bonds. The answer is not very encouraging. The Town Clerk points out that there are anomalies in municipal financing, which he says are barriers to the application of "sound, well-established, and "easily-understood principles."

From the Progressive municipal standpoint, the worst of these anomalies is that Parliament has permitted and encouraged municipalities to engage in new enterprises without enlarging their power to contract debts. The restrictive clause of the Public Health Act applies not only to borrowing powers immediately under that Act, but to others since created. One effect of this is that a corporation who have been particularly energetic, and have gone in for electric lighting schemes, the opening of museums, and the erection

of artisans' dwellings, have to pay for their energy in the restriction of their original borrowing for sanitary purposes. Another anomaly is that there is no principle defining the period for which loans are contracted. This is particularly noticeable in the case of land. The Plymouth Corporation have the following different terms for the repayment of loans for freehold land: 60, 50, 48, 46, 31, and 30 years. For land on Dartmoor, on which they constructed water-works, they are allowed 60 years in which to repay the loan; but for land on another part of the moor, upon which the lunatic asylum stands, the cost of the purchase has to be met in 30 years. With regard to one estate, utilized for different purposes, Parliament allowed 60 years for the purchase of part of it; the Local Government Board granted 48 years for another loan; and the Board of Trade, 30 years for a third. The Town Clerk's opinion is that the term ought in each case to be 100 years; and that the 60 years' term errs, if it errs at all, in favour of posterity. His general conclusions are that the terms of repayment should be, for all freehold land and permanent buildings, for water-works, and for street works, 60 years; and for tramways, 40 years. As to electricity works, he excuses himself from recommending any term, though he says he strongly inclines to the opinion that the present term is too short.

All this naturally leads to the advice that the Corporation should seek relief from their present embarrassment by obtaining a longer period in which to pay off their debts. Parliament may some day take up the question and deal with it comprehensively; but the Town Clerk of Plymouth does not think the signs of early public legislation hopeful, and suggests that a Private Bill should be promoted. If this were done, and the Bill gave all that the Town Clerk thinks it ought to give, Plymouth would save £7000 a year, which is equal to a rate of 4d. or 5d. in the pound. This, of course, is something; and if it were likely to be a permanent gain, we can fancy the ratepayers becoming enthusiastic about it. But what is most likely to happen is that if it obtained this relief the Town Council would proceed at once to contract fresh obligations; and the latter state of the ratepayers would be worse than the former. However desirable it may be in itself to remove anomalies like those referred to, it does not seem probable that the ratepayers under a Progressive Corporation of the Plymouth pattern would derive much benefit from the change.

The Commercial and Broadstairs Bills in the House of Lords.

The Committee work of the House of Lords was resumed last week, when progress was made with certain Gas Bills. The Commercial Company's Bill had been committed as an opposed measure; a petition against it having been lodged by the London County Conucil. There was no appearance in support of the opposition, however, and accordingly nothing was done in this regard; but it appears from the Journals of the House that on Thursday another petition against the Bill was deposited by the Poplar Borough Council. The Broadstairs Company's Bill was considered by a Committee presided over by Lord Hawkesbury; strong opposition being offered by the Urban District Council and the landowners to the proposal of the Company to take a new site for works under the conditions fully gone into before the Commons Committee. The matter of the site was not left in a satisfactory state by the decision come to by that Committee, who imposed some restrictions on the height of the gasholders, and required the planting of a belt of screen trees round the land. The interest of their Lordships was centred, early in the proceedings, in the question as to the suitability of the site in respect to the amenities of the locality. It was stoutly contended that the site had been ill chosen, from the point of view of the residents, inasmuch as it would, in the natural course, come right into the centre of the developed town, to which it would do an irreparable injury. This contention ultimately prevailed with the Committee, who decided that the Bill could not be allowed to go on with the site clause. Thus the Company will have to come to Parliament again with another proposal. The difficulty is a purely local one, and therefore no question of general principle arises out of the fate of this year's Broadstairs' Bill—if it is not of the nature of a reminder that the susceptibilities of the public have to be considered, as well as the economic and manufacturing suitability of sites for the ever-growing gas-works required by flourishing residential town and pleasure resorts. It is increasingly difficult, almost everywhere in this crowded country, to obtain adequate gas lands at reasonable cost, which is a consideration that the gas industry of the future will have to reckon with. It is all very well for writers of magazine and newspaper articles on popular hygiene to extol the advantages of gas-fuel for the general service of a town community, including the cure of the smoke nuisance; but there is another side to the picture, which such experiences as this of the Broadstairs Company bring to light.

Damage to Gas-Mains by Sewerage Works.

The Ilford Gas Company's action against the Ilford Urban Council, to recover £1000 damages for injury alleged to have been done to the Company's gas-main in Green Lane, Ilford, by the sewerage works of the Council in the same thoroughfare, will be found reported in full in another column. The hearing was before Mr. Justice Lawrance and a Special Jury, in the King's Bench Division, and it occupied three days of last week—ending in a verdict for the Company, with £200 damages. A question of liability as between the Council and their Contractor was left over to be argued before his Lordship, without a Jury, upon his return from circuit. The Jury, however, interposed a finding that there had been no negligence on the part of the Contractor, which rather prejudices this issue, and was objected to by the Counsel for the Local Authority. With this part of the dispute, we have nothing to do. The point of interest for gas companies is confined to what happened to the main. It will be well for all gas companies' advisers to read the particulars of our report for information concerning the operations which led up to the damage to the pipe. The defence was that the Gas Company's claim was exorbitant, and that nothing exceptional had been done to justify the granting by the High Court of the large relief sought by the Company, which included a proposal for laying a substituted new main on the other side of the road to that occupied by the sewer. There was the usual conflict of opinion as to the quality of the road work done in pursuance of the contract. An important point in the arguments of Counsel was as to whether the Company ought to be paid for their spilt gas at the cost price or the selling price. Counsel for the Company said that they were entitled to recover the selling price of the article, by virtue of a principle laid down by the Court of Appeal in the "arsenic-in-beer" case. We venture to remark that this has not been the value put upon lost or unaccounted-for gas in the practice of the most experienced engineers. The gas that is lost is so much coal and working charges thrown away; it is not an extra quantity that would have been sold at a profit if it had not been wasted. By the amount of their verdict—one-fifth of the sum claimed—the Jury seem to have thought the Company's demand was an exaggerated one; for though they obtained a verdict, the defence to the action was amply justified by the result.

High-Pressure Gas and Low-Pressure Electric Lighting.

It is quite well worth the notice of gas engineers, and of all friends of the gas industry, that there has lately emerged from the clash of experiences and interests in the business of artificial lighting a fresh point of economic superiority of gas to electric lighting, which is as reassuring as it was unexpected. Gas engineers do not forget the early bumptiousness of the electricians, when the latter presumed to speak scornfully of the "crude," "unscientific," "dirty," and other alleged unlovely aspects of coal-gas manufacture and utilization, as compared with the electric light. They do not, however, jeer at their trade rivals nowadays, although it is the unhappy experience of electric light companies to be constantly haled before the Magistrates for creating nuisances under the Smoke Prevention Acts; while, with regard to scientific accuracy of manufacture and all the rest of it, the wastefulness of electric machinery and processes is far and away beyond the gas managers' modest tale of unaccounted-for gas. What we particularly desire to show at present is the remarkable distinction between the economy of the latest improvement in the distribution of electricity and that of the equally modern style of gas distribution. The high-voltage current is the latest word of electricians striving to do the best they can for themselves; and this is dead against the interest of the consumer. In connection

with this, it is important to observe that the American electric lighting industry as yet knows nothing of distribution at 200 volts. It is too hard upon the lamps. In America, the electric light companies supply the lamps of their customers upon an inclusive tariff for current and lamps. Consequently, there is no market for an extravagant article; and the standard electric incandescent lamp in the American home trade has for years been a 16-candle lamp taking 50 watts. On the other hand, the modern English 200-volt lamp is found to consume 20 per cent. more current than a 100 volt lamp giving the same amount of light; but as the current is paid for by meter, this does not grieve the supplier, to put it mildly.

There is corroboration of this view of the facts in a communication recently made by M. Weissmann to the French Physical Society, and noticed in the "Builder." The author proposes a novel system of electric lighting whereby, as he says, consumers may effect considerable economies in their meter bills. This suggestion rests upon the fact that electric lamps supplied at high pressure are considerably less economical than similar lamps made for, and supplied at, low pressure. M. Weissmann has made such lamps, of 16-candle power at 22 volts, which take only 1·7 watts per candle when first put in circuit, and after 400 hours still take less than 2 watts per candle. Consequently, it is proposed to put small transformers in the lamp-fittings upon ordinary central station circuits, to let the voltage down at the point of consumption to the most economical figure for the power of the lamps in use. Our contemporary rather shakes the head over this plan, but declares that "there "is such a large difference between the cost of light from a "high-pressure and from a low-pressure lamp, that it will "well repay electricians to devise methods of utilizing the "latter in circuits where the pressure of supply is from 200 "to 250 volts." This is just the information we have been seeking in vain for years. Now that it is in the possession of gas engineers, it will be their own fault if they do not make the best of the diametrically opposite condition which prevails in high-pressure incandescent gas lighting, where the higher the pressure the cheaper is the light.

The Colour for Street Lamp-Posts.

THE subject of the colour which is, on the whole, the most suitable for painting street lamp-posts withal, is one of the most important of the many practical problems left to be solved, according to their unaided lights, by District Surveyors and (occasionally) by Gas Managers. It is not a subject that anybody has ever read a paper upon; but it can safely be said that never a year passes without some poor official of a town council or a gas company having occasion to wish he knew something definite about it. We are constrained to notice the subject here, because at the present time a large section of the City of Westminster is in course of being swept and garnished for the Coronation. Among other street fittings that are being "done up" for this grand occasion, stand the lamp-posts; and these are one and all suffering a remarkable change, in being painted of a particularly nauseating tint of kharki-colour. That is to say, it might as properly be called "kharki" as anything else; some might try to dignify it by the name of "old gold." But having so far particularized the tint, we must leave to other observers the responsibility, first, of naming the colour correctly, and, secondly, of saying how they like it. At first sight, the colour strikes one as being atrociously ugly; but this is a question of taste, and tastes can notoriously be acquired. Therefore, it is seldom safe to dismiss off-hand a picture (or even a lamp-post) as badly painted, unless it obviously offends some reasonable rule of art. Now, this the kharki lamp-posts do not do. Having regard to the probable effect of weathering upon the original crudity of the colouring—accentuated by the shining of the new paint—and bearing in mind the consideration that it is a virtue on the part of lamp-posts to escape notice, it is not so certain that kharki is altogether a bad wear for such features of London street architecture.

Of course, what is a suitable tint for lamp-posts depends upon the locality. Where the posts occur among foliage, they should be painted dark green, in order to avoid introducing an incongruous touch of artificial colour amid the herbage. Where the green is made too dark at first, it soon becomes absolutely black, and might as well have been so painted in the beginning. French taste revolts strongly against the grimness and lack of reflecting sparkle to which all painted surfaces descend sooner or later; and accordingly their best lamp-posts are polished up with wax. Apart from the considerable cost of this treatment, it is not of a piece with sober English taste. But this is no reason why we should go to the other extreme, and endure sooty-black lamp-posts in our gloomy terra-cotta fronted streets. Having regard to the ruling consideration that the colour of lamp-posts should be of a retiring cast, there is a good deal to be said for kharki, especially if the too infrequent visits of the scrubbing-brush, which alone is able to remove mud splashings, are to be hushed up. A pillar letter-box occupies a position in the street at the opposite end of the scale of notoriety from the humble lamp-post. Consequently, it is rightly painted the most vivid scarlet, in order that it should not be overlooked. By the same reason, nothing else except fire alarms ought to wear this gay "uniform" colour.

It occurs to one, as an exception to the rule just formulated, that where the street-lamps are of a distinctly ornamental character, and therefore call for notice on their own merits, it is a mistake to treat them all of a piece with the common, ordinary lamp-post which bears a light for the night and nothing more. Perhaps the best way to ensure this exceptional treatment is to make the substance of the structure of something—as polished granite—which does not lend itself to painting at all, but only needs cleaning and polishing. There is a good deal in this observation which should be kept in mind when the architecture of lamp-columns is in question. Unhappily, in England there are few examples outside London, and a very few of the largest towns, of public lamps which are deserving of particularly respectful treatment. This is at least one of the things they do better on the Continent.

Justice before Generosity.

The Electric Lighting Committee of the South Shields Corporation are very properly desirous of making the undertaking in their hands as successful as possible; but they must take care that their efforts in this direction do not prejudicially affect others. A few weeks ago, they offered to supply electric current free of cost, during the months of May, June, and July, to consumers whose premises were wired in those months. This was, of course, a very liberal offer on their part; but was it just to the general body of ratepayers? The South Shields Gas Company thought not; and, as will be seen by a paragraph in our "Electric "Lighting Notes," they promptly communicated, through their Solicitor, with the Committee on the matter. They regarded this free supply of current to new customers as an exhibition of the "undue preference to any local authority, "company, or person" which is expressly forbidden by section 20 of the Electric Lighting Act, 1882; and, as large ratepayers, they expressed their intention of applying for an injunction to restrain the Corporation from carrying out their offer, unless the Committee themselves withdrew it. The Town Clerk has explained that their object is to relieve the pressure upon the department caused by connecting up new supplies in the early autumn; and that, as these customers will take current up till Sept. 30, 1903, there will be no loss whatever, but rather a benefit, to the ratepayers. He does not see that the Committee are showing "undue preference" to the new consumers. But surely they will get their current on better terms than the other consumers; and this, it appears to us, is what the Act of Parliament expressly prohibits. Judging from the tone of his reply, the Electric Lighting Committee will not recede from the position they have taken up, and so we may expect to hear more of the matter. The question is one upon which a judicial opinion would be valuable.

Promoting the Cause of Inclines in America.

Things move fast among our American friends. On May 2, Mr. Frederic Egner was at Cambridge viewing, with the members of the Institution of Gas Engineers, the inclined retorts there. The following day he had commenced his journey home to America; and, on the 21st, he was reading a paper to the Western Gas Association, meeting in New Orleans, in which he related the information he had gathered anent the installations of inclined retorts he had inspected during his visit in England. Mr. Egner came purposely to make the round of nearly all the inclined retort-houses in

the country; but after he had seen a number of successful ones, he had to abandon the task he set out to accomplish—it was far too great, and he found the experience gained in one house was in degree that obtained in others. Mr. Egner does us the honour of calling attention to our recently tabulated statistics showing the progress of the inclined-retort system in Great Britain up to the date of the publication of the figures in March last. Since then we have had to amplify the figures a little in regard to the then existing installations, through the omission of the Nottingham benches. The figure he quotes from the table as to the number of inclined retorts in this country is 8087; it should be 8199. The estimated total productive capacity is consequently raised from 106,015,000 cubic feet to 107,715,000 cubic feet. It is very satisfactory to find an engineer of the eminence of Mr. Egner in American gas circles speaking so highly of the successful working of the installations he investigated in this country. Before he came, he had a strong liking for this system of carbonization; and what he saw has strengthened it, and will do much to increase the prospects of the adoption of inclines in his own country. The backwardness of the system there is about the only thing in which he can admit that American gas-works are behind those of this country; and his paper throws light on the causes which have retarded movement in this one direction. It seems that the inclined retort has been regarded too much as a speciality; and there have been doubts as to structural stability and working efficiency. Fear that sloping retorts would slide out of position appears to have been engendered by a piece of defective construction twelve years ago, or (the reading of the paper leads us to assume) by the omission of adequate bracing. Properly braced, there can be no such trouble; and few engineers would display their want of capacity by confessing themselves incapable of preventing a difficulty of the kind. The ability to realize uniform heating in inclined settings has also been questioned; but Mr. Egner's experiences at works north and south in this country have enabled him to give his colleagues some convincing testimony in this respect. The cost of erecting, maintaining, and repairing inclined retorts compared with horizontal ones has also been debateable points upon which, it may be believed, Mr. Egner's argument, appealing to common-sense, has made some impression. These we gather from the paper are some of the reasons which have kept inclines in the background in America. But they are coming to the fore there now; and Mr. Egner's name will outstand as that of one of, in his day, the most powerful champions of the system in that country.

Workmen's Compensation Funds.

It may be useful to large employers of labour to call attention to a clause in the Omnibus Bill of the Swansea Corporation, which has received the sanction of a Select Committee of the House of Lords presided over by Lord Hawkesbury. The Home Office, in their report on the measure, had "called attention" to the clause, which, in other words, means that they were not favourably disposed towards it. Its object is to enable the Corporation to form a fund with which to pay compensation to men injured in their employment. The Corporation are carrying out extensive water-works; they also have the laying down of tramways before them; and they are about to construct light railways. In respect to the water-works, they have 900 men working; and the number will be considerably increased when they come to carry out the light railways, &c. Therefore the Corporation desire power to form this compensation fund, instead of insuring. The clause had already met with the approval of Lord Morley. Lord Hawkesbury's Committee were satisfied with the proposal, and permitted it to proceed in the Bill. This is another proof of the intention of Parliament to maintain their supremacy over departmental bodies. Here is a clause which will manifestly work beneficially to all concerned; and similar power has been allowed in other Bills. Yet the Home Office viewed it with disfavour; but they have not had their own way.

Some Tests of Gas Oils.

A matter which is of great importance to the industry, in view of the extended use of carburetted water-gas plant, is at the present time the subject of investigation at the hands of Messrs. Raymond Ross and J. P. Leather, whose communication, on the "Constitution of Gas Oils," submitted to the Manchester Section of the Society of Chemical Industry early last month, is noticed in the "JOURNAL" to-day. The matter will be more prominently brought before the gas profession this week, in connection with the paper which Mr. Leather is to read at Southampton; but meanwhile attention may be drawn to the results so far achieved by the authors, who say they hope in the future to be able to give more precise and definite information on the question with which they have been interesting themselves. The investigations already carried out deal with the four principal gas-making oils now on the market—namely, Russian, American, Borneo, and Texas. Gasifying these oils at a temperature of 1350° Fahr. (which experience with carburetted water-gas plant has demonstrated to be the best heat to be maintained at the point where the oil enters the carburettor), the authors find that the American and Russian "Solar" oils are practically of identical merit; and that Russian refined, Texas, and Borneo oils follow in the order named—the latter being less than half the value of the two first-named. They are, however, careful to point out that, by working at different temperatures, it is quite possible somewhat better results might be given by some of the oils—especially by the Russian refined. The deductions drawn with regard to the approximate composition of the oils examined, lead the authors to the opinion that, by a series of experiments, some means could be devised whereby an oil might be obtained from the Borneo fields of much greater value than the present one for gas-making purposes. The conclusion of the investigations in which Messrs. Ross and Leather are just now engaged will be awaited with great interest by the increasing number of engineers and managers who use oil in the manufacture of gas.

Sulphate of Ammonia Supply and Demand.

A paper contributed by Mr. J. Thiry to the Iron and Steel Institute, on the "Recovery of Bye-Products in Coke "Making," contains interesting information with regard to the future prospects of sulphate of ammonia. It has so often recently been argued that the general adoption of bye-products coke-ovens would increase the output of sulphate of ammonia to such an extent that the supply would greatly exceed the demand, that the author, wishing to get at the true facts of the case, caused inquiries to be made on the subject. As a result, he elicited an opinion from the German Association for the sale of the article, which he regards as quite trustworthy. The Association state that the best evidence of the maintenance of prices in the future is afforded by a study of the published returns relating to the manufacture of sulphate of ammonia since 1895, and a comparison of the fluctuations in price corresponding to the state of the market for the same period. Though the production in Westphalia has increased from 10,043 tons in 1895 to 49,223 tons in 1900, the price during this same period has risen from £7 18s. to £10 6s. per ton. This certainly goes to prove that, within certain limits at all events, it is possible to increase the output without prejudicially affecting the price. But that there is no limit to the demand for sulphate of ammonia, must not, we think, be any too readily taken for granted. Though there may be no need to fear that any probable increase in the quantity manufactured would so reduce prices as to render the product unprofitable, it would be somewhat rash to calculate upon existing rates being fully maintained with (say) double the present output per annum. Mr. Thiry points to the possibility that, at the present rate of production, the nitrate fields will be completely exhausted in 23 years, and it will thus become imperative to increase very largely the production of nitrogen—that is, ammonia—to meet the demand. This may be so; but 23 years is a long time to look forward to, and what the annual make of sulphate of ammonia may be at the end of that period cannot even be conjectured. The welfare of the gas industry is to a certain extent bound up with the demand for this valuable bye-product, and it is to be hoped that the prices now obtainable will be permanently maintained—if not increased. We cannot, however, refrain from expressing the fear that in course of time the production may increase to such an extent as to interfere with its disposal. But it may be taken for granted that, when (if ever) the output of sulphate of ammonia does exceed the demand, gas undertakings will find themselves in a very much more favourable position for continuing its manufacture at the lower price that will then be obtainable, than will other makers the profits on the working of whose plants depend upon the satisfactory

disposal of this article. The output has already reached very large figures; the estimated world's production for 1901 being given by Mr. Thiry as no less than 523,000 tons.

A Shallow Tramways-Subway for London.

Considerable importance to Gas Companies attaches to the acceptance by Mr. H. Hobhouse's Committee of the preamble of the Bill of the London County Council for making a shallow tramways-subway underneath the new street from Holborn to the Strand, which will provide a connection between the Victoria Embankment and Theobald's Road. It will be the first example of its kind in this country; and the question of the disposition of the gas-mains will present some interesting features. Though the idea of the tramways-subway is supposed to be taken from examples of the same kind of construction in Paris, Boston, and New York, it is worth noting that in none of these particular examples do the gas-mains run in the subway. Nor is it at all easy to see how they can acceptably do so in the proposed instance. It will be absolutely impossible to do main and service work, and make pipe connections, in a tunnel which is at the same time in the occupation of the public. Therefore, it looks very much as if the new development of subways favoured by the London County Council would have the unexpected effect of leaving gas-mains out of the structure, which would be an odd result. They may obviously be accommodated in side subways, separately ventilated into the street; but then they would still be out of the chief subway, and could not be made to contribute towards the cost of its construction, which is part of the scheme. After all is said and done, however, the putting of tramways underneath busy streets is so plainly the proper course to take, that no baseless objection to it is likely to be raised by the proprietors of pipes and cables. The Gaslight and Coke Company are notoriously complaisant to a degree in meeting the wishes of the London County Council, or the Corporation, whenever it is a question of doing anything for the relief of the pressure of traffic on the streets. That the Company never get the smallest thanks is not to the point; they do their duty every time.

WATER AFFAIRS.

The Progress of the Water Inquiry.

THE good progress made with the consideration of clauses by the Joint Committee on the London Water Bill on the resumption of their inquiry after the Whitsuntide recess, enabled them to dispose of the suggested new clauses at their sitting last Tuesday, and adjourn for a week. To-day they will take up again the clauses which were allowed to stand over, and also the schedules to the Bill—including, of course, the formidable No. 3—and then, as we understand, proceed uninterruptedly with their task till its completion. Last Tuesday's sitting opened with a renewal of the application, on behalf of the Lea Conservancy, for the insertion of a clause securing to that body sufficient water stock to produce the £8000 annually paid by the New River and East London Water Companies for their rights in the water of the Lea. Lord Balfour pointed out that, as long as the new Board were solvent, the Conservancy would be sure to get their money; and Mr. Fitzgerald added that the Board would have at their back the whole of the rates of London, so that the solvency alluded to by his Lordship would be pretty well assured. The proposed clause was therefore rejected. The next matter to engage attention was an application, on behalf of the Middlesex County Council, for a new clause to secure from the Water Board as good and sufficient a supply of water as that which would be afforded by the Water Companies at the time of the passing of the Bill. The Kent County Council wished to have a saving clause to the effect that nothing done under the Act should prejudice any future application by them to Parliament for the severance of the portions of the county within the limits of supply. These and certain allied matters were decided to be outside the purview of the Bill; but an undertaking was given that the decision should not prejudicially affect any future application to Parliament by the various authorities concerned.

After the midday interval, the Committee were occupied with the question of the compensation to be awarded to the Directors of the Water Companies for the loss sustained by them through the abolition of their offices by the passing of the Bill. The matter came up on a clause proposed by the Companies, and Mr. E. Boulnois, M.P., and Colonel Lockwood, M.P., the Chairmen of the West Middlesex and East London Companies, were called in support of it. They pointed out to the Committee that these directorships were regarded as, to all intents and purposes, appointments for life, and on this understanding men had in certain cases sacrificed other engagements in order to devote the whole of their time to the duties. It seemed only just, therefore, that the holders of these positions should be compensated for the loss of them. Of course, the County Council objected to the clause, and called for the production of any Act under which water-works had been transferred to a public body, wherein provision such as that proposed had been made for compensating the Directors. Mr. Fitzgerald said the wish of the Local Government Board was to leave the matter in the hands of the Committee, without expressing any opinion on the principle of compensation. After some deliberation upon the matter, the Committee decided to accept the principle, so far as the Directors in office at the date of the publication of the notices for the Bill are concerned. The amount of compensation is to be awarded by arbitration to each Company, and distributed "at sight of the Company." A question which has for some time been much in evidence in Sunbury and the district—the rating of reservoirs at only one-fourth of their annual value—was disposed of, so far as it was connected with the Bill. The Sunbury District Council and the Association for Promoting the Equitable Rating of Reservoirs submitted a new clause providing for raising the rate to the full annual value; and it was supported by the Middlesex and Surrey County Councils. Lord Balfour expressed the sympathy of the Committee with the principle of the clause, but said they were unanimously of opinion that the Bill should not be the medium for making an important amendment in the general rating law such as the one proposed. This decision brought the sitting to a close.

Good Management at Sheffield.

THE report which Mr. William Terrey, the General Manager of the Sheffield Corporation Water-Works, presented to the Water Committee last Wednesday furnishes further proof that the undertaking in their hands is being well conducted. We have, on previous occasions, recognized the ability with which Alderman Gainsford and his Committee look after this important revenue-earning department of the Corporation, and have testified to the desire manifested by them to secure for the consumers the greatest possible advantage from the possession of the water-works by the Municipality. The figures given in another part of the "JOURNAL" show at first glance a decrease of £2329 in the surplus remaining at the close of the past financial year, compared with the corresponding period of 1901. This does not, however, mean retrogression, but is the outcome of the concession made to the consumers last September by the remission of the remaining half of the 25 per cent. increase in the charges sanctioned by the Act of 1864 to cover the expenses of the Dale Dyke reservoir disaster. The time allowed the Corporation for levying this charge was up till Dec. 25, 1905; so that it has been anticipated by upwards of four years. But for this remission, which must be regarded in the light of a rebate, the surplus would have shown an increase of £3956. In the first few years of the Corporation's management, deficiencies were recorded; but since then, with one single exception (in 1896), there have been surpluses, which from 1897 have grown considerably, concurrently with the gradual removal of the extra 25 per cent. already referred to. Furthermore, a sum of £13,218 was handed over to the district fund last year in respect of the costs of obtaining the Water Act of 1887. So that, altogether, the Water Committee have made the city a present of about £33,166, which is equal to a rate of 6d. in the pound. The result of their labours is the existence of a substantial surplus of £86,116, while the consumers are being charged for their water rates which are among the lowest in the kingdom. All through the dry weather of last summer the constant service was never interrupted; and its continuance will be assured in the future by the works now being carried out by the Corporation in the Little Don Valley, and by the large scheme in which they are associated as members of the Derwent Valley Water Board. Altogether, the Water Committee, their General Manager, and the consumers must be congratulated on the position of the undertaking with which they are so closely concerned.

THE

INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE THIRTY-NINTH ANNUAL GENERAL MEETING,

HELD AT THE

ROYAL VICTORIA ROOMS, SOUTHAMPTON,

JUNE 10TH TO 12TH, 1902.

Mr. S. WESTALL DURKIN, President.

INAUGURAL ADDRESS.

Gentlemen,—It is usual for the President to thank the members, at their annual meeting, for the honour of placing him in that position. Why your choice fell upon me, it is difficult to say; for I am afraid, in looking back, that I have done little to deserve the honour, but nevertheless will ask you to accept my thanks and

> "Be to his faults a little blind
> And to his virtues very kind."

I am pleased to welcome you to my native town, with its beautiful surroundings, and trust you will enjoy your visit to the full.

It happens that I am serving my fiftieth year of service with the Gas Company here; so you will see I am bordering on the time known as the "sear and yellow leaf." When I started on my career as a pupil under my predecessor, the late James Sharp (whose memory I revere), gas engineering was not as it is to-day. It is true there was Thomas Greaves Barlow, Thomas Hawksley, and Alexander Croll, former Presidents, and others who could be named; but young men had not the advantages in training for their work as in these later days. I recollect becoming a member of the School of Art in this town. The master put me on to freehand drawing. At last, I resented this, and said I wanted some knowledge of mechanical drawing, and was given a plan, a section, and an elevation of a lead-pencil to start with. However, later on I had the assistance of a friend who started a mechanical drawing class, and obtained some further knowledge, but had to train myself a good deal. But it was a case of "knowledge coming after." I have no doubt many others were in the same position as myself in those back days; but as the years have passed on, these things have been changed, and with a perfected knowledge of what is required, young men of to-day (if they do not give themselves up too much to sport and pleasure) can, and may be, better equipped for the duties devolving on a gas engineer, and this equipment becomes imperative in these days of competition with other means of artificial lighting.

It has been my pleasure for many years past to have received valued help and assistance from my esteemed, friend John Birch Paddon, who became Consulting Engineer to my Company prior to Mr. Sharp's retirement (when I was young and inexperienced); and I take this opportunity of thanking him for what he has been to me all these years.

I must not weary you further with these personal matters. I would generalize a little so far as this town is concerned on our so-called "decaying industry." The manufacture of gas in 1852 was 34 million cubic feet; in 1901, it was 547 million cubic feet; and it is still advancing. The town and suburbs are growing fast; and the works have to keep ahead of the increase. Already a set of new purifiers and a two million gasholder have been erected; and other plant must be shortly laid down to complete a third section of producing power. Difficulties of obtaining land have had to be met; and the Executive of my Company have been successful in coping with the trouble. There is a great future before this Company; and we cannot sit with folded arms. The increasing responsibilities of gas managers in these days get heavier year by year; and it is no exception in my case.

It was in the early sixties that our carbonizing plant was transformed from iron to clay retorts, with the necessary equipment of exhausters. This was a step in advance, although direct firing and hand stoking is adhered to, and still holds a position in the works here. Owing to the prescribed area, our retort-houses are short; and this would involve heavy expenditure in machinery, and to put in regenerator furnaces would mean going below the high-water level of our river. But notwithstanding we may be thought behind the times, we have done fairly well, and, given a fair quality of coal, we average 10,927 cubic feet to the ton. I have been troubled with choked ascension, bridge, and dip pipes, and thick tar in the hydraulics. The one follows the other; and this led my assistant to suggest an experiment. I now set out some advantages obtained by the use of 20-feet retorts divided in the centre.

1.—A considerable reduction in the number of stopped ascension, bridge, and dip pipes, consequent on making the gas produced in each 10 feet of retort pass up the ascension-pipe attached thereto.

2.—If one end chokes (which is an infrequent occurrence), only half the retort is off work. With through retorts and an ascension-pipe at each end, it is quite a common occurrence (although the dip-pipes have been set for an equal seal) that the gas will pass up only one pipe at one time, and another time the other, and *vice versâ*, with the result that one pipe, having all the work to do, quickly chokes, and then the other follows. In this case, the whole retort has to be out of action, with consequent loss of gas during the clearing of pipes.

3.—The tar in the hydraulics keeps very much thinner; and with Livesey and Tanner's overflows, this is a great boon.

4.—What choking does take place has been brought nearer to the retort—viz., at the entrance to the ascension-pipe. But it is nothing like the trouble, and it is a more get-at-able place. A few strokes of the auger quickly clear it.

5.—Another advantage is that, whichever gang is ready first starts charging, without waiting for the opposite side (as in through retorts), who are not so active or may have had a slight hindrance.

6.—Another point which I think may safely be claimed, is less naphthalene produced—the gas not having travelled over so much heated surface as in a through retort, more especially if only one ascension-pipe acts.

7.—Scurfing only half a retort is required at a time. The carbon is, when sufficiently thick, cut away by the usual means, and comes away *en bloc*.

I have had a favourable opportunity of comparing the results obtained by the divided and the through retorts—the two systems working alongside one another, with two benches to one hydraulic each side. In the case of the hydraulics connected with the two benches divided in the centre, the tar gives no trouble; it keeps so fluid that one of the two cocks on each side is open only, whereas the others need constant attention to prevent choking with thick tar.

The following table will show, by comparison, the practical results of two months' working, Oct. 8 to Nov. 4, and Nov. 13 to Dec. 13, 1901:—

	Through Retorts.	Divided Retorts.
Ascension-pipes and at mouthpiece .	Average 144 ..	49
Bridge and dip pipes	,, 276 ..	80

This shows a considerable reduction, and to the advantage of the divided retort; and further the character of the tar in the bridge-pipes is of a spongy character, with traces of ammoniacal liquor and no sooty matter or pitchy tar. I am gradually extending the system as benches are renewed.

Clay retorts, when introduced here, were blessings in disguise. Some years since more producing power was required, and a retort-house, originally fixed up for iron retorts, was remodelled for clay retorts, and in the same area some 100 per cent. more gas was made. This leads me to think that, where land is scarce, there may be economy in the introduction of sloping retorts. You have to go up, it is true; but you gain in ground-space, and this system, for the reasons stated, will possibly have to be considered here.

Carburetted Water Gas.—We have been running this system for about two years; and three sets of plant have been placed in part of a retort-house, for 1,300,000 cubic feet per day, in a space formerly producing 320,000 cubic

feet of coal gas—being an increase in producing power of nearly a million on the same area. The disused coal-stores are arranged for the necessary boilers, engines, blowers, and exhausters—making, so far, a very compact plant, which has worked satisfactorily. But let me say there are many details which you have to find out, and "when found make a note of" for future use. I am not in a position to give you any figures as to cost, owing to want of space for a separate station meter; but, for our purposes, we work on estimates. I find we use for generators and boilers 49·3 lbs. of coke per 1000 cubic feet of water-gas made.

Purification.—At the works under my charge, the principal agent used is white chalk lime with oxide catch-boxes. Since 1898 we have been working under the sulphur clauses; but for this we were quite prepared, having worked up for it for several years prior to that time. The areo-oxygen process, duly measured in, has proved very useful. The cost works out for coal and carburetted water gas at 0·82d. per 1000 cubic feet of gas sold. From some figures collated, the quantity of unslaked lime per ton of coal used, and per 1000 cubic feet of carburetted water gas as estimated, stands as under. For the year 1901:—

Per ton of coal carbonized	25·36 lbs.
Per 1000 cubic feet of carburetted water gas	7·09 ,,

The two gases are separately purified, and mixed at the inlet of the catch purifiers. In the catch purifiers when used for coal gas only, a considerable quantity of naphthalene was formed; but this no longer takes place with the mixed gases. I do not, however, find it cures the trouble in the distribution plant.

Distribution.—In an increasing district, this part of our work needs much consideration, to apportion the size of trunk mains, to feed the lateral mains, and to keep up a generous supply throughout the district. I find that in 1853, the areas of the outlet-mains here were 161 sq. in.; in 1901, they were 1288 sq. in., for supplying the urban and suburban districts.

The rapidly extending system of prepayment installations renders it desirable, when opening up a new district, to provide larger mains than formerly. As an example, in the early part of 1899 my Directors determined to go in for this system; and in less than two years I laid in between 5000 and 6000 new services for these installations alone, and we have not yet finished, nor saturated the whole of our district. So I find that the days of 2-inch and 3-inch mains are numbered, and 4-inch is becoming my favourite minimum. The labour is about the same, and the extra cost of pipes will well pay.

In going out from the works into different parts of the district, we have to pass under railway level crossings and over iron bridges; and in the latter case the joints are made with rubber-rings, and the spigot impinges on a plaited cane washer. We have experienced no trouble from the expansion and contraction of the structures.

Municipal enterprise gives trouble where electric light and tramway service is supplied by them. We have had several narrow escapes from catastrophe; but up to the present time only two cases of electrolysis, and three or four short circuits. [The damaged pipes are here for your inspection.] But what the future will bring forth, I cannot say. The authorities seem to think "sufficient unto the day is the evil thereof." We may hear more of this from Mr. James Swinburne, M.Inst.C.E., in his lecture to us.

Under this head, it may be of interest to show, for five years ended in 1901, how the day-load has increased, as against the night-load:—

		Cubic Feet.			Cubic Feet.
1897.	6 a.m to 6 p.m.	152,119,000	..	6 p.m. to 6 a.m.	285,240,000
1898.	,, ,,	159,033,000	..	,, ,,	292,738,000
1899.	,, ,,	176,523,000	..	,, ,,	302,494,000
1900.	,, ,,	202,030,000	..	,, ,,	309,335,000
1901.	,, ,,	227,724,000	..	,, ,,	319,849,000

In these quantities is included the unaccounted-for gas, which may be taken at 5 per cent. The increased day-load is accounted for by the use of 5700 prepayment ranges, and 2480 ordinary ranges on hire. The Sunday day consumption during warm weather is enormous.

Gas-Engines.—This is an increasing quantity, although we have no local manufactures. The engines are used for various trade purposes, from chopping sausage meat up to printing the five local newspapers; the number in use being 142. The united horse power is 665, and ranges from ½ to 20 horse power.

Street lighting here, in the principal thoroughfares, is carried out by electric light from the Corporation works; and for the time the gas-lamps are ousted. In other parts of the town, gas is still used; and the Lighting Authority have recently had the temerity to experiment with incandescent gas lighting.

It may be of interest to state that one of the Urban District Councils supplied by this Company adopted the incandescent system with ordinary lanterns, using the plain inverted pear-shaped globe and the "C" bye-pass burner; and their Surveyor informs me that four mantles were used per lamp for nine months. But in two lamps he had fixed up, six mantles in one and nine mantles in the other were used in twelve months. The mantles appear to vary in quality.

The electric light has been supplied at a loss; and my Company, with other non-users, have had to pay their proportion of the cost in the rating. This, of course, adds to the price of gas at the meter; but no one seems to trouble about it.

The Welsbach system is in very general use; and now that mantles are cheaper (thanks to Mr. Livesey) it will no doubt increase even if the output decreases, and it will be the right thing to step in and look after these consumers.

When this Company went to Parliament in 1898, we had 1 candle added (that is, from 14 to 15 candles); but I very much doubt whether it is appreciated. The extra cost is not worth the candle.

I presume it would hardly be the correct thing not to say a word about the naphthalene trouble. It is still with us; and, notwithstanding the use of carburetted water gas, I do not find any diminution in stopped service-pipes or mains. I am, however, assured that it will go; but perhaps an addition of 50 per cent. may be required to get over the difficulty.

There is one thing I do know—that, for some time past, on one of our districts, where we were troubled in certain places on the leading main as well as in service-pipes, the Hastings carburation process has been working; and I am delighted to say that there is a complete immunity from complaints, and the plant laid down will cope with an increasing demand more readily than at present.

I must now draw these cursory remarks to a close. In doing so, I would urge on young men to make use of every advantage at their disposal, to be fully equipped for the conflict before them, for "knowledge is power," and a good character is better than great riches. Our employers, be they company or corporation, as well as ourselves, are indebted to many outsiders for experience brought into practical use—such as Crossley Brothers and Tangyes, and Mr. Dugald Clerk (whose paper we are expecting presently), and others, who have perfected the gas-engine. For developing the use of gas for cooking and technical purposes, much is due to Mr. Thomas Fletcher; and then, on matters chemical, it is always delightful to hear a Vivian Lewes. I must not forget the Technical Press, who keep us so well supplied with matter for study and reflection; but whether we have time to absorb all the matter, is another question.

I trust the amalgamation of the Institution and Institute will take place.

I have only to say that what I have put before you has been more managerial than engineering, and this under many difficulties; and, if the matter is not up to the mark, my intentions were good. I thank you for so patient a hearing.

The Formation of Natural Paraffins.—Numerous theories have been put forward at different times to account for the formation of natural paraffins, the one received with most favour being that due to Berthelot and developed by Mendeléeff, in which the action of steam upon metallic carbides was regarded as the main source of the hydrocarbons. The chief stumbling-block to this view was the difficulty of explaining the mode of formation of the naphthenes of the Russian oilfields. We learn from "Nature" that the researches of MM. Paul Sabatier and J. B. Senderens on the action of reduced nickel, iron, and other metals upon hydrocarbons, have now placed the "chemical" theory of petroleum formation on a firm experimental basis. By the direct hydrogenation of acetylene in the presence of nickel, they have obtained liquid mixtures of hydrocarbons which can be made to correspond either with American or Caucasian petroleum by varying the conditions of the experiment. To account for the formation of petroleum, it is thus sufficient to admit that there are in the depths of the earth free alkali metals and metallic carbides, which in contact with water give rise to mixtures of hydrogen and hydrocarbons. These gases encounter nickel, cobalt, or iron in a finely divided state, and thus give rise to the mixtures of hydrocarbons forming natural petroleum.

ESSAYS AND REVIEWS.

THE LEGAL RELATIONS BETWEEN GAS SUPPLY UNDERTAKINGS AND CONSUMERS.

(*Continued from p.* 1475.)

THE next division of our subject may conveniently deal with the remaining sections relating to the use of meters.

METER RENT.

The gas company may charge a consumer such rent for the hire of meters, stoves, or fittings, as the consumer may agree to pay; and such rents are recoverable in the same manner as amounts due for gas supplied (G. C. 1871, s. 18). Section 14 of the Metropolis Gas Act provides that no meter rent shall exceed 10 per cent. on the net cost of the meter—presumably, 10 per cent. per annum is meant, but the section does not state—but this only applies to companies exempt from the 1871 Act.

PREPAYMENT METERS.

By the Metropolis Gas (Prepayment Meter) Act, 1900, it is provided that the Metropolitan Companies shall not charge for the hire of any prepayment meter and fittings to be used therewith any sum other than a sum of money calculated according to the quantity of gas supplied through such meter; and the maximum sum to be so charged shall be at the rate of tenpence per 1000 cubic feet so supplied—such sum to include the hire of one meter and the fittings used therewith, and the providing, letting, fixing, repairing, and maintenance of the meter and fittings, and the cost of collection, inspection, and any other cost incurred by the company in connection with the meter and fittings (sec. 4). The rate fixed is open to revision by the Board of Trade upon the request of any of the Companies or the London County Council or the City Corporation (sec. 5). Receipts for money collected from prepayment meters must show the rates per 1000 cubic feet charged for gas and rent, &c., respectively (sec. 6). For a prepayment meter hired without fittings, the rent chargeable must not exceed 10 per cent. per annum on the cost of the meter (sec. 7).

The Companies' Acts respectively relating to ordinary meters apply, so far as applicable, to prepayment meters (sec. 7).

METERS, STOVES, AND FITTINGS NOT LIABLE TO DISTRESS.

Meters and fittings let for hire are not subject to distress, or to the landlord's remedy for rent of the premises where they are used, nor to be taken in execution under any process of a court of law or equity, or any proceedings in bankruptcy against the person in whose possession they may be (G. C. 1871, s. 18). "Fittings" include gas-stoves. (*Gaslight and Coke Company v. Hardy* [1886] 17 Q.B.D., 619).

PENALTY FOR INJURING METERS, &c.

Every person wilfully, fraudulently, or by culpable negligence, injuring, or suffering to be injured, any pipes, meters, or fittings belonging to the company is liable to forfeit to the company a sum not exceeding £5, in addition to which the company may recover the amount of the damage sustained, and, notwithstanding any contract with respect to the supply of gas, may discontinue the supply until the injury is remedied, but no longer. (G. C., 1847, s. 18; 1871, s. 38).*

REPAIR OF METERS.

Company's Meters.—The company must at all times, at their own expense, keep all meters let for hire by them in proper order for correctly registering gas; and in default of their so doing, the consumer shall not be liable to pay rent for the same during the period of the default (G. C. 1871, s. 19). This section is not quite consistent with, and would probably be held to override, section 18 of the same Act, which provides that the company may let for hire any meter "on such terms with respect to the repair of such meter . . . as may be agreed upon between the hirer and the undertakers."

Consumers' Meters.—Every consumer must at all times, at his own expense, keep all meters belonging to him whereby any gas of the company is registered in proper order, and proper and sufficient in all respects for correctly registering such gas. In default of his so doing, the company may cease to supply gas through such meters. (G. C. 1871, s. 17).

Penalty for Using Unstamped Meters.—Any person knowingly using an unstamped meter, is liable, on conviction, to forfeit a sum not exceeding £5; any sale made by such meter is void; and the meter is liable to be seized and forfeited or destroyed. (S. G. 1859, s. 17.)

ACCURACY OF METERS.

Margin of Inaccuracy Allowed.—No meter may be stamped as correct by an inspector appointed under the Sale of Gas Act, 1859, which is found to register, or be capable of being made (by any contrivance for that purpose, or by increase or decrease of the water in the meter, or by any other means practically prevented in good meters) to register, quantities varying from the true standard measure of gas by more than 2 per cent. in favour of the Company or 3 per cent. in favour of the consumer. [These percentages are reversed in error in the margin of the Sale of Gas Act.] A meter having a measuring capacity at 1 revolution or complete action of the meter of not less than 5 cubic feet, and having permanently marked on it in some conspicuous place, "without float," may be stamped as correct if found correct in every respect, except that it is capable of being made, by abstraction of water, to register against the company. Such meters may only be lawfully used by written agreement, between company and consumer, specifying that this description of meter is used. (S. G. 1859, s. 12).

Penalty for Counterfeiting Official Stamp.—This is, for every offence, not less than £10 nor more than £50; and any person knowingly selling, exposing for sale, or lending, any meter bearing a counterfeit stamp, is liable to a fine of not less than £2 nor more than £10. (S. G. 1859, s. 14).

Testing of Meters after Usage.—The company must be afforded access by the consumer at all reasonable times to inspect, take off, remove, test, and replace any meter, whether the property of the consumer or of the company. In the case of a consumer's meter, the expense of such removal, testing, and replacing shall be borne by the company if the meter prove correct, but otherwise by the consumer (G. C. 1871, ss. 17 and 19). Presumably, such expenses would, in the latter alterative, be recoverable from the consumer. But there is no direct enactment to that effect; and we should doubt if they are ever claimed. If the meter be found slow, the company is the gainer by the discovery and the replacement of the incorrect meter by a correct one; if it be found fast, the consumer is generally so much annoyed to find that he has been overcharged that it would be decidedly inadvisable to ask him to pay the expenses incurred in discovering the error.

There are no enactments directly bearing upon the question of who shall pay the expenses incurred by a consumer in having a meter hired from the company removed, sent to the testing-station, tested, and brought back to the premises. There is, in fact, no section authorizing the consumer so to remove and test a hired meter; and to do so without giving the company twenty-four hours' notice in writing would be an offence, punishable by a fine not exceeding £5 (G. C. 1871, s. 15). A consumer putting up a second meter to test the accuracy of the company's meter without advising the company was fined under this section. (See *Re Gaslight and Coke Company*, "JOURNAL," Vol. LVII., p. 1196.) Presumably, it would be held that the cost should be borne by the consumer if the meter prove correct, but otherwise by the company. The Sale of Gas Act only authorizes the consumer to have any meter tested on the premises where it is used. Section 20 provides that:

At the request and expense of any buyer or seller of gas, who shall give twenty-four hours' notice (or if the head office of the person to whom such notice is to be given be more than 20 miles distant from the meter, 3 days' notice) to the other party to the contract, it shall be lawful for any duly authorized inspector of meters to enter any premises or place whatsoever within his jurisdiction where any meter is fixed or used, and examine and test, and, if necessary for such purpose, remove the meter, doing as little damage as may be. The meter, if found incorrect within the meaning of the Act, must not be refixed or used again, unless and until repaired (so as to measure and register correctly) and re-stamped. The fees payable for such removal, examination, and testing are double those provided for by section 19 of the Sale of Gas Act, and are payable by the buyer or seller of gas as may be determined by a Justice of the Peace, and be recoverable accordingly—unless, of course, as would generally be the case, the incidence of the expenses was agreed on by the parties.

Dispute of Test.—Section 21 of the Sale of Gas Act provides that, if either party disputes the accuracy of the inspector's test, the inspector must give his reasons in writing for his decision, and the dissatisfied party may then require the meter to be re-tested by two other inspectors named by any Justice of the Peace having jurisdiction in the district where the meter was tested. The unanimous decision of these inspectors is final, except in case of appeal to the General or Quarter Sessions (see *post*). If the two inspectors do no not agree, the decision of the inspector who first tested the meter is to be considered final, except in the case of appeal to the Sessions. The expenses incurred by reason of such a dispute are to be ascertained and their incidence determined by a Justice of the Peace, and may be recoverable in any court of competent jurisdiction.

Appeal to Sessions.—All persons who think themselves aggrieved by any act or decision of any inspector of meters, or by any order, judgment, or determination of Justice of the Peace, Mayor, or

* The company must publish the short particulars of the several offences for which any penalty is imposed by the Gas-Works Clauses Acts, or any Special Act incorporated therewith, and of the amount of every such penalty, and must cause such particulars to be painted on a board, or printed upon paper and pasted thereon, and must cause such board to be hung up or affixed on some conspicuous part of the principal place of business of the company; and where any such penalties are of local application, must cause such boards to be affixed in some conspicuous place in the immediate neighbourhood to which such penalties are applicable or have reference; and such particulars must be renewed as often as the same or any part thereof is obliterated or destroyed; and no such penalty is recoverable unless it has been published in the manner hereinbefore required (G. C. 1847, s. 40, and Railways Clauses Consolidation Act, 1845, s. 143). For a case where a gas company failed to obtain a penalty (under G. C. 1871, s. 15) through failure to comply with the foregoing requirements as to exhibition of a list of penalties, see letter from the Secretary of the Llanelly Gaslight Company, Nov. 30, 1901 ("JOURNAL," Vol. LXXVIII., p. 1466).

N.B.—This footnote applies also to penalties set out in section relating to "Obtaining or Manipulating Supply by Fraud" (*ante*, p. 1476.)

Magistrate, relating to any matter contained or mentioned in the Sale of Gas Act, may appeal to the presiding officer at the then next practicable General or Quarter Sessions (S. G. 1859, s. 22).

Penalty for Obstructing Examination.—Any person who, by preventing or refusing access to a meter or otherwise, obstructs or hinders any examination or testing authorized by the Sale of Gas Act is liable to a fine not exceeding £5, and to pay the cost of removing and testing the meter and the expense of purchasing and fixing a new meter. (S. G., 1859, s. 15).

Right of Entry to Remove Meters and Fittings.

Section 17 of the Act of 1847 gave any gas company the right, after twenty-four hours' previous notice to the occupier of any premises from which they might be authorized to cut off and take away the supply of gas, to enter such premises between the hours of 9 a.m. and 4 p.m., and remove the meter and all other property of the company. This section, however, except so far as it is incorporated in Special Acts to which the Act of 1871 does not apply, was repealed by section 22 of the latter Act; and between the two sections there are differences to be noted. The 1871 Act provides that the 24 hours' notice must be in writing, under the hand of a properly-authorized officer of the Company. If the premises be unoccupied, the notice must be served upon the owner or lessee or their agents. Most important of all, the right of entry is by the later Act only given in the case of premises "through or in which the supply of gas *is . . . discontinued*." This deprives the company of the right of entry in cases where they are authorized to discontinue the supply of gas but are unable to do so if denied access to the premises. This is a fruitful source of trouble in the case of many tenement houses—blocks of flats particularly—in which the supply-pipes are so arranged that it is practically impossible to cut off the supply to only one tenant except by disconnecting the service at the meter inside the flat or tenement. If access for this purpose is refused, the debtor can continue to consume gas; and much trouble is often experienced in such cases in enforcing payment by legal proceedings, owing to the difficulty of serving the summons.

Access to Read Meters.

Any officer appointed by the company may at all reasonable times enter any building or land lighted with gas supplied by them for the purpose of ascertaining the quantity of gas consumed. Any person hindering such officer from entering and making such examination at any reasonable time is liable to forfeit to the Company a sum not exceeding £5 for each offence. (G. C. 1871, s. 21).*

Meters for Public Lamps.

If either the company or the local authority requires the gas consumed by the public lamps to be consumed through meters, such meters must be provided and fixed by the company, and paid for by the party requiring that they should be used.

(To be continued.)

ELECTRIC LIGHTING MEMORANDA.

Concerning Controversy with Electricians—Confusion of Electric Lighting with Tramway Traction—Do Electric Trams Pay?—The Burden of Electric Lighting at Kingston-upon-Thames.

It is an old saw that two parties are needed to make a quarrel; and the same rule applies to the more polite and useful form of threshing out differences of opinion which constitutes a journalistic controversy. Whether the reason is their diffidence, or extreme amiability, or whatever its nature, the fact remains that we appear to be unable to screw our electrical contemporaries up to the point of defending themselves against strictures which we have thought proper to pass in the columns of the "Journal" upon their style of dealing with the subject of the comparative cost of gas and electric lighting. They remain completely silent on the point. Does this mean that they are driven to "absolute and unconditional surrender" of their position, the moment it is made plain to them that a mere trader's assertion, similar to the familiar announcement that "Jones's Sausages are the Best and Cheapest," does not carry conviction? Meanwhile, although not answering our recent comments upon this style of electrical argument (?) the "Electrician" has favoured us with a patronising observation or two upon last week's "Electric Lighting Memoranda," which ran upon the subject of electric tramways traction, and quoted from the "Electrician" itself some statistics relating to Liverpool and Birmingham which go to show that the system is not all that it was expected to be. Feeling duly grateful for the attention, we will proceed to investigate the merits of this fresh ground of disagreement.

The "Electrician" professes itself puzzled to discover what electric traction may have to do with gas lighting. Let us attempt to explain at least why the subject is discussed in the particular part of the "Journal" which is weekly devoted to matters in connection with electricity, and is therefore not a portion of this periodical that specially relates to gas lighting. It is simply because municipal suppliers of electricity for lighting, which is a business competing with the gas industry, are everywhere being driven by force of circumstances to run lighting undertakings in conjunction with electric tramway traction. It is becoming impossible to separate the finance of municipal electric lighting from municipal electric tramway working. Sometimes it is the lighting charge which is made to help the tramway branch, as in the case of Liverpool; sometimes it is the contrary. Whichever way it is done, the result remains that the competing gas industry in such localities is liable to suffer wrong from this incorrigible propensity on the part of local authorities to confuse their trading accounts. Why, then, should we be called in question for occasionally letting a little daylight into this complicated corporation book-keeping?

But, of course, the "Electrician," after taking its customary exception to our competency to have an opinion concerning electrical finance, goes on to challenge the conclusion of last week's "Memoranda" that "electric power, which cannot beat steam on main lines of railways, cannot beat horses on town tramways, from the point of view of remunerative working." We are bidden to tell this to tramway managers who have tried both, and see what answer they will give. Then comes this fine burst of assertion: "The almost universal effect of the replacement of the horse-car by the trolley-car has been permanently to double the traffic and to reduce the expenditure to below 50 per cent. of the receipts. In America, Europe, the United Kingdom, everywhere it has been the same. Balance-sheet after balance-sheet proves it. Why, then, does our usually careful and cautious contemporary talk so foolishly?" Whatever our foolishness, the data we used were taken from, and ascribed to, two balance-sheets of corporation tramway enterprises duly published by the "Electrician" itself. Really, if it is not wise to speak after such a source of information, where should one go for better? And this is the bald statement of fact, given in the "Electrician" for the 30th ult., that Liverpool, although getting its electricity from the corporation at an inclusive charge of 1·2d. per unit, works electric tramway traction at a total cost of 7·166d. per car-mile; while in Birmingham the cost was 10·72d. per car-mile. At Blackpool, the cost is 8·54d. per car-mile. Is this cheaper than Mr. J. Allen Baker led the London County Council to expect, in 1897, or dearer? It is idle to indulge in these question-begging assertions in face of such facts, if they are facts. Of course, if on any line the traffic can be "permanently doubled," that will bring down the proportion of the working expenses (these remaining constant) to the receipts. But where are the balance-sheets that prove this to have been "the almost universal effect of the replacement of the horse-car by the trolley-car?" According to the Liverpool balance-sheet published by the "Electrician," the percentage of total expenditure to revenue is 69·1; while in Birmingham the ratio is 76 per cent. Which is a reader to believe—the accountant of the "Electrician," or the editorial asseverator of our foolishness? Does not the latter gentleman study the contents of his own periodical? It appears not, from this evidence, and his late ignoring of reports of the proceedings at the Birmingham meeting of electricians who discussed the Nernst lamp.

The attention of local authorities yet trembling on the verge of an electric lighting enterprise should be directed to the melancholy experience of Kingston-on-Thames. The annual report on the working of the undertaking and its revelations was discussed at the Town Council meeting on the 27th ult., when Councillor Francis moved the appointment of a Committee to inquire generally into the position of affairs, with power to spend £100 on expert advice. A special meeting of the Council is to be called to consider the question, which is of great moment to the town. The ratepayers are losing heavily year by year; and the business is not growing as fast as the capital expenditure. It is a serious emergency for Kingston.

A COMPARISON BETWEEN THE BRITISH AND THE UNITED STATES COAL SUPPLY.

The extent and character of the coal deposits of America must be a subject of much interest to buyers of coal throughout the world, especially in localities where this source of supply competes with the English commodity. Mr. A. S. E. Ackerman, an English engineer, who has recently made a tour of inspection of the United States coalfields for the "Colliery Guardian," has written an article on the general subject in the current number of the "Engineering Magazine," which contains a mass of valuable information.

Mr. Ackerman first draws attention to the enormous difference in the total area of the coalfields of America and Great Britain—namely, 222,500 and 9000 square miles respectively. There are also, of course, other great differences. Thus nearly all the British deposits have been worked for a much longer period than the American, with the result that most of the thick seams and those nearest the surface have been worked out. While 10 and 12 foot seams are not unknown in England, they are exceptional; and seams as small as 12 and 15 inches are being worked. In America, on the other hand, the coalfields are practically untouched. At present, only the thick and upper seams are being worked, and these to a large extent without any thought for the future. In Great Britain, also, faults in the coal measures are frequent and great, and the coal lies at all angles. In America, there are no faults in the measures yet touched; and the mines are but as shallow pits in comparison with the depth of the

* See Note to "Penalty for Injuring Meters," on opposite page.

English shafts. Mr. Ackerman does not know of a single drift mine being worked at present in England; but in the bituminous fields of Virginia, these are common. The coal is simply quarried out. American mines are not fiery, which favours the use of electrical coal cutting and hauling machinery.

The output of coal per head per annum from all the persons employed in mining is 300 tons for Great Britain, as against 526 tons in America; the difference being due, as Mr. Ackerman perceives, to a large number of factors, of which the natural conditions already indicated form an important part. Mining, or rather coal-getting, machinery is much more used in the United States than it is in England; but this is admittedly largely because the American mines are not shaft-pits. American engineers confess that their shaft-mine practice is inferior to the English. Many American mines require no pumping; the water running out by gravity and the haulage being horizontal. These advantages, with the absence of gas, render the coal cheap and easy to get. Another point which is in favour of America is the absence of subsidence claims and other property charges; the land and mines being usually in one ownership.

After the coal is brought to the surface, the treatment of the mineral for transportation differs widely in the two countries. British coal-trucks only hold 6 or 10 tons each. These are almost the only sizes made, though recently some English railways have built 20 and 30 ton trucks. In America the usual coal-carrier is a 50-ton pressed-steel car. The next considerable difference between the two countries is the freight charges per ton-mile; this figure in England being about six times what it is in America. The difference in the sizes of the cars accounts partly for this; but the relative cost of the land is estimated by Mr. Ackerman as the larger factor. Owing to this consideration, the cost of American railways is only about one-fourth that of British railways; and this enormous handicap is one which is not likely to be removed. At present, the export of American coal is comparatively small; being but about 2½ per cent. of the total production of the country, and about one-tenth the amount of the British export. But it is likely to grow, especially for the Mediterranean. As the pit-mouth value of American coal is almost exactly half that of British coal, and as there is not a very great difference in the quality of the coal of the two countries, taken as a whole, it would seem as if the entire question as to the possibility of American coal competing with British in the European markets depends on the cost of freight and handling between mines and markets.

The above is doubtless the reasonable view to take of the question of the competition of American with British coal; and it will be interesting to English coalowners and users to know precisely how the matter stands in this regard. As to gas coal, there is very little difference between good American bituminous mineral and the Durham article. It is due to Mr. Ackerman, who, we understand, was once connected with the British Gas-Engine Company, to remark that he shows his good sense and trained powers of observing facts from all sides, in the clear way in which he sets forth the reasons why United States coal is cheap, and why it can be cheaply carried. Less skilled observers—such as generally air their views on similar subjects in English newspapers—are accustomed to use strong expressions respecting the lack of enterprise of English colliery proprietors, who make little use of machinery for coal cutting, and the greed of English railway companies in the matter of rates. It is not to be imagined, however, that a system of deep shafts and thin seams can compete on equal terms with coal which can be simply quarried into as in the Connellsville region, and every morsel of a 15-foot seam dragged downhill into daylight. And as regards the railways of the United States, the prime reason for their low minerals rates is easily understandable from Mr. Ackerman's plain statement. As a matter of fact, railway charges must be fixed everywhere upon a paying scale; and this happens to be lower in the United States than here. Whether British railways could be run more cheaply with coal in 50-ton cars, is a matter for the companies and the coal merchants to settle among themselves. It is also a question in which British gas companies and the enterprising dealers and agents who serve them with rail-borne coal should be interested.

There is no good reason why a 50-ton coal-truck should not be as common an object upon many English railways as it is in America, if there is any economy in its use. Our railways should be better able to bear these large loads than the American lines; but seeing that such cars are carried upon bogie trucks, the weight on every wheel is not more than it is in the case of a small English truck. If there is any advantage in carrying coal in such large units, however, gas engineers will be well advised to keep the possibility in mind when designing railway feeders for their retort-houses. This is an illustration of the way in which one consideration in mechanical engineering is linked with another. It would be interesting to have some expressions of opinion on the point from engineers of gas undertakings owning their own railway coal-trucks, and consequently free to make them of any size desired. A competent American authority has declared that the heavy engines, cars, and trains for freight service have come to stay, for the reason that the "maximum train" method of handling the traffic shows an ultimate economy. The permanent way and other details have to be adapted to the new conditions of working, because the economical consideration is the governing one of the service. This is the accepted American opinion. If it is valid, there seems to be no good reason why it should not hold equally good for England.

THE GAS AND WATER STOCK MARKET.

Peace at last; but to the surprise of many, the expected boom on the Stock Exchange did not come off. It appears that the protracted negotiations and the slowly strengthening conviction of a happy result, led to the actual fact being pretty largely discounted in advance; so that, immediately upon the proclamation, weak operators rushed to realize. The consequence was that, in some of the more sensitive markets, there was actually a fall instead of a rise. But in the Funds and the choice gilt-edged securities, there was a moderate advance; and there is fair ground for believing that, as soon as the weaker profit-snatchers have been shaken out, a steady rise in the markets may be looked for. In the Money Market, the demand was pretty strong at first, and rates were well maintained; but the stringency eased off before the close. Opinions are much divided as to how money will incline for the next few months; but, on the whole, perhaps the prospects are against any tightening of the market. In the Gas Market, business was a good deal more active than in the preceding week or in any very recent week; but transactions were almost wholly confined to the issues of the three largest Companies. And prices were almost as steady as they well could be, for in the London market only one Company was affected, and there the move was in the upward direction. In Gaslight issues, there was quite a large volume of transactions in the ordinary, which changed hands daily at 94 or a fraction higher or lower. The closing mark was the best of the week; but the quotation could not quite achieve an advance. Of the secured issues, the debenture looked like rising; but the maximum was not very strong. South Metropolitan had a chequered career. It opened weak, and fell to 118; and then, suddenly recovering, it jumped to 122, and finished with a mark of 123. Commercials were very quiet and unchanged. In the Suburban and Provincial group, nothing was done on the London Exchange; but at the Mart a good line of Tottenham "B" and other shares were readily disposed of. In the local market, Liverpool "A" had an advance. In the Continental Companies, a fair amount was done in Imperial at about middle figures, European was marked once at top price, and Union was left untouched. In the Water Companies, there was more animation than has lately been displayed, as if they too were about to revive with the peace; but it dwindled away to nothing. There was no marked consistent tendency shown in the prices; and the only actual change in quotation was a rise of a point in East London debenture.

The daily operations need not be more particularly referred to. South Metropolitan fell 1 on Monday, and recovered it on Wednesday, and advanced a further 1½ on Thursday. The debenture gained 1 on Wednesday. On Friday, East London 3 per cent. debenture rose 1.

OBITUARY.

News has just reached us of the death, on the 2nd ult., of Mr. F. T. Crowder, a well-known figure in business and political circles in Western Australia. Among other positions filled by the deceased gentleman was that of Chairman for a number of years of the Perth Gas Company.

We regret to learn, from the number of the "Journal des Mines à Gaz" just to hand, of the recent death of M. Paul Aguitton, of Marseilles. The deceased gentleman's whole life was devoted to the gas industry, with which his father was connected in the capacity of Manager of the Gas Companies at Béziers and Montpellier. On leaving the Central School of Arts and Manufactures in 1877, M. Aguitton entered the Lyon-Perrache Gas-Works; but two years later he joined the Marseilles Gas Company, of which he was Engineer until 1900. He was not only an able technician, but also possessed a thorough knowledge of the chemistry and physics of gas, as shown by his communications to the Société Technique on the subjects of purification and the relation of the heat of combustion of coal gas to its illuminating power. It may be remembered that an able paper on the last-named subject was presented to the Society in 1893, and a translation given in the "Journal" at the time. It is only just to mention his name in connection with this question, seeing that the calorimetry of gas has lately been much under discussion. As a Manager, M. Aguitton was firm, yet kind and considerate, and he was therefore greatly esteemed by those who served under him. His simple and affable character gained for him only friends.

PERSONAL.

At the Old Meeting House, Norwich, last Saturday, Mr. Philip J. J. Moon was united in marriage to Elsie, fifth daughter of Mr. Clement J. Frost, of Kett's Hill. In addition to many presents from numerous friends, Mr. Moon, who is Assistant Engineer and Manager to Mr. Thomas Glover, received from the employees at the gas-works a handsome timepiece, as a token of their esteem and congratulation. The Norwich office staff also presented him with suitable mementos of the occasion.

The Directors of the Littleborough Gas Company recently presented a marble timepiece, bearing a suitable inscription, to

Mr. S. E. Halliwell, Manager and Secretary, on the occasion of his marriage. Mr. J. C. Hudson, the Vice-Chairman of the Company, made the presentation. On the following day Mr. Richard Ashton, who has been foreman at the works for about forty years, asked Mr. Halliwell to accept a handsome dressing-bag, as a mark of the esteem in which he is held by the employees.

Mr. Ernest Astbury has been appointed Assistant to Mr. Vincent Hughes, Gas Engineer to the Smethwick Corporation. Mr. Astbury, who is the son of Mr. Thomas Astbury, of Messrs. Moberley and Bayley, Stourbridge, holds an Honours certificate in "Gas Manufacture," and was for four years articled pupil at Smethwick to Mr. B. W. Smith (now of Walsall). For the past two years, he has been with Messrs. W. J. Jenkins and Co., of Retford; during which time he superintended the erection of a complete installation of inclined retorts at Liverpool.

The retirement of Mr. George Anderson from the position of Engineer and General Manager of the City of Waterford Gas Company, which took place on the completion of his eightieth year, on the 16th of April last, afforded the officials and workmen an opportunity of testifying the affection and esteem they had always entertained for him. This they did by means of an illuminated address, which is reproduced in the current number of the "Literary Guide." It is a most artistic production, having Mr. Anderson's portrait in the top left-hand corner, and a view of the works in the opposite corner at the bottom. The donors acknowledge the kindly interest always taken by Mr. Anderson, as chief of a large undertaking, in the welfare and happiness of the workmen employed in it; and they express their heartfelt desire that he may enjoy a well-earned rest for many years to come, and that the autumn of his life may have "a glorious sunset." The address bears the names of Mr. J. G. Tooms, the Manager, and nine representatives of the subscribers to the testimonial. Mr. Anderson acknowledged the gift by letter, in the course of which he said this was the fourth time in his career that he had been the recipient of similar kindness in connection with gas undertakings with which he had been associated. With regard to Waterford, when he took over the concern from the old Company, the works were very old-fashioned, and the city was only partially piped. The annual consumption was 16 million cubic feet, the price was 6s. 8d. per 1000, and the Company had not paid any dividend for ten years. Now the consumption is 62 millions, the price 4s. 6d. to 3s. 6d., and the shareholders get a dividend. In addition, the advent of Mr. Anderson meant an immediate rise of 2s. per week in the stokers' wages, and further advances, with numerous other improvements, followed with the development of the business. Referring to his own career, Mr. Anderson said he had been brought up as a workman from the age of twelve to twenty-five, and had always been steady. He advised all those whom he addressed to be the same. The use of gas was extending, and there was a happy outlook for all. Let every man, therefore, keep his wits clear and look ahead, so that the future might bring happy days for all.

NOTES.

The Estimation of Prussian Blue in Spent Oxide.

A recent number of the "Chemiker Zeitung" contained an article on this question by Dr. O. Bernheimer and Dr. Schiff, of Vienna. In order to obtain more exact figures, they had endeavoured to calculate the percentage of blue from the proportion of iron in the purified prussian blue corresponding to it. A preliminary test showed that prussian blue obtained from pure potassium ferrocyanide, on incandescence, actually yielded a quantity of iron oxide exactly proportional to the ferrocyanide taken. Experiments with oxide, however, always gave higher results than those given by Knublauch's method. But the latter method, according to further tests by the authors seemed to show correctly the total percentage of potassium ferrocyanide. The oxide, however, apparently contained also other compounds, which were capable of precipitation with iron salts, but were free from iron. These, on treatment of the mass with alkali and potassium ferrocyanide passed into solution, and on gravimetric determination of the iron led to a too high value being obtained. Under certain conditions, also, the Knublauch method appeared to yield somewhat too low results. The authors intend to pursue their experiments.

Merits of Water-Tube Boilers.

The study of the pseudo-science of newspapers affords many interesting points for the consideration of technicians. It is remarkable, for example, how certain journals permit themselves to become obsessed with a particular idea respecting a matter of general importance to the community, such as the connection between the flash-point and safety in use of kerosene, and the merits of water-tube boilers. When once the position has been taken up, no amount of evidence avails to change it. The newspaper controversy upon the merits of the water-tube boilers in warships curiously ignores the evidence of the vogue of this type of steam generators for shore purposes. It has been stated over and over again that the water-tube boiler, though comparatively wasteful of fuel, possesses the inestimable superiority over the Lancashire boiler that it is susceptible of being forced at a pinch to very much more than its normal steaming capacity. It is also, for many industrial purposes, capable of burning coke and coke breeze to good effect. There are other recommendations of the water-tube boiler which will occur to technicians.

A Gas-Power Funicular Railway.

A combination of gas and electric engineering is employed in the traffic arrangements of the wire-rope railway which runs from Vevey to Mont Pélerin, Switzerland, and serves two villages on the way as well as conveying sightseers to the mountain top. There is a looped track, and one car is attached permanently to each end of the rope; so that as one comes down, the other goes up. The cable is driven by means of a system of pulleys worked by a 70-horse power direct current electric motor through a belt and gearing. The electrical equipment also includes a battery of accumulators. The power is generated by a gas-engine which drives a dynamo, and is provided in duplicate. When starting the gas-engine, current is taken from the battery, and the dynamo is used as a motor. The same thing also happens when the descending car is loaded and the ascending car is empty. The battery is large, and is always used to drive the belt motor; the gas-engine being too small for this purpose. This means that the generator plant is always working at full load into the battery, and therefore at its maximum efficiency. The average gradient of the line is 33·5 per cent. The engines employed are supplied with the "poor gas" which is such a favourite form of fuel in France and Switzerland, by a simple form of producer worked with an air-blast from a fan belted to the engine. The consumption of poor coal is at the rate of 1·32 to 1·40 lbs. per horse-power-hour.

Purification of Blast-Furnace Gas.

The presence of dust and other impurities in blast-furnace gas has been prejudicial to its more general use for driving engines; but it is claimed for an appliance devised by Herr Theisen, some particulars in regard to which were given in a recent number of "Le Génie Civil," that it is capable of effecting considerable improvement in this respect. The apparatus receives per minute 170 cubic metres (6000 cubic feet) of the gas from the furnace, at a temperature of 120° to 160° C.; and it reduces the quantity of dust to 0·004 and 0·006 gramme per cubic metre, and the water to 12 and 20 grammes, which necessitates 55-horse power. Bringing down the quantity of dust to 0·004 and 0·006 gramme per cubic metre is exceeding good purification. At Friedenshütte, in Silesia, a reduction to 0·002 gramme has been obtained, but only by means of sawdust filters, which are very expensive. The power required to drive the Theisen apparatus is not by any means great; for 170 cubic metres of gas per minute at 150° C. represent about 110 cubic metres at 0° C., or 6600 cubic metres per hour, which is sufficient to produce 2000-horse power. Consequently, the power utilized is 2·8 per cent. of the total quantity available. A furnace producing 150 metric tons of cast iron per 24 hours liberates about 30,000 cubic metres of gas per hour. A single Theisen apparatus of the latest type would therefore suffice to thoroughly purify the gas from such a furnace with an expenditure of not more than 120 to 130 horse power.

Midland Association.—The members of the Midland Association of Gas Managers who visited Malvern may be interested to know that the photograph taken of the party in the grounds of the Imperial Hotel has turned out splendidly. Anyone wishing to have a copy can do so by sending a postal order for 3s. 6d., either to Mr. H. P. Maybury, or to Mr. Bushnell, Photographer, Malvern.

Slow Sand Filtration for the water supply of Providence (R.I.), seems to be assured at last, after ten years' agitation for purer water. A Special Committee of the City Council has recommended the improvement named, and the Council have passed an ordinance directing the Commissioner of Public Works to contract for a plant, to be built on city land at the Pettaconsett pumping-station, in accordance with the plans of the City Engineer, provided the cost does not exceed $225,000.

The Card Index for Technical Literature and Gas-Works Memoranda.—Considerable interest has been shown in the article on card indexing which appeared in the "Journal" for May 13; and Professor H. Wade Hibbard has since forwarded a copy of his paper, which was therein referred to. Professor Hibbard intimates that he will be very pleased to forward a copy of the paper free to anyone sending an application for it to him at the School of Railway Mechanical Engineering, Sibley College, Cornell University, Ithaca, N.Y.

Tests of Coal and Natural Gas.—Experiments carried out in the United States to test the relative costs of coal and natural gas for steam-raising purposes show a distinct gain in favour of coal. For the purposes of the experiments, the price of natural gas was taken at about 4d. per 1000 cubic feet, and the coal used was a West Virginian screenings variety, costing about 9s. a ton. The expense of evaporating 1000 lbs. of water by using natural gas was about 8½d., while coal evaporated the same amount at a cost of less than 6d. Another test was made last November with Indiana coal, and in this case also not only did the coal again make power about 30 per cent. cheaper than natural gas, but the efficiency of the boiler and stoker was so much greater that the coal evaporated 1000 lbs. of water at a cost of just above 3d.

COMMUNICATED ARTICLE.

GAS MATTERS IN THE UNITED STATES.

The New Orleans Booster.

Mr. Shelton's New Orleans proposition seems to be the most interesting subject of discussion in a number of circles in New York.* The gas men are distinctly divided into two camps; and their views are as diametrically opposed as views can be. First, the pro-Shelton view. This view seems to be the official one, and was expressed by one of the "Holy Fathers" in these words: "My boy, if Shelton said he would do it, Shelton will say that he has done it; and the young men in the Gaslight Association will be his echo and say so too. So there is no use in saying what I think about his plan." I asked him if he had made any figures on the problem, and he answered: "Not one. Shelton has it up to him to make a new set of data; and he has written his name so large on the history of the trade by doing things we all said would not succeed, that if he said he could put a quart of water into a pint bottle, I should believe he could until I had seen him try—and fail." Evidently this state of mind was not one to be regarded as "judicial;" so we wandered off to the general problems of pumping gas, and I told him of certain experiments with "greased air," in which the grease was all squeezed out under a pressure of 7½ lbs. above the atmosphere.

The other view may be called the anti-Shelton view. This also came from one of the "Holy Fathers." He said: "It will make no difference. Shelton, so fortunate in his undertakings generally, owes his success in general to his wonderful nerve. He never admits a mistake, and few have the will to bring them home to him. He has made his fair share of blunders; but the world has forgiven him for the sake of his successes." "Will he succeed this time? Blessed if I know. He will say he has, and that is all we will ever know about it. But mind this, the experiment of service at high pressure is being tried in so many places that we are bound to have some *bonâ fide* data before long.'

This was certainly a bad beginning. But men have pumped gas and air so much in the United States that data are not wanting; and so I took the article to a couple of experts, and said: "Tell me what you can?"

Both of them kindly and gravely took the matter up in detail. Neither of them was willing to commit himself very positively. Both of them said: "The matter looks doubtful from our point of view; but it is really quite outside of our experience. We are engaged in delivering relatively small quantities of air under high pressure, not large quantities under small." Investigation also showed that all the theoretical calculations in regard to these questions made recently in this city have been based on D'Arcy's formula; and even the users seemed inclined to doubt if it would fully apply. From some nameless source, I learned that more than one proposition to pump gas long distances was under discussion, but that the manufacturers are taking no responsibilities. "If you will name the task the machine is to perform, we will furnish the machine to perform the task at the machine; but we will not guarantee the delivery through miles of pipe under conditions beyond our experience." This attitude was noticeable in the offices of all men who do this business in the large way.

Knowing something from practical experience about the transmission of compressed air, I am inclined to look at Mr. Shelton's project from another point of view than the one taken by many. It is not that the project is Mr. Shelton's which influences me, it is that the project could be so easily reversed. In hundreds of stores in the United States are "change deliveries" working on a fraction of an inch of pressure, in which the speed of the delivery shows the rate of passage of a wave. In one of the stores in this city, they kindly allowed me to measure the time required to send a package—the regular flying box—and to, in a way, determine the speed. The box passed through 350 feet of 2-inch brass pipe in a space of time varying from 7 to 12 seconds; in its flight passing eight times 360° of curvature, mostly used in turning 90° angles. The pressure in front of the box—that is, in the direction in which the box was going—was said to be 2 inches less than the atmosphere behind it. If this is a fact, then some of our notions need revision. It is quite notable that the establishments who use the pneumatic delivery seem to regard the "suction scheme as better than the forcing one," though I cannot get any definite reason why.

One man who has pumped an immense amount of air at high pressure, in examining the scheme as given in print, said: "I think that Mr. Shelton's design is dead-wrong. I have used the systems of long suction and short suction, and of short delivery and long delivery; and unless there are insurmountable obstacles in the way, I much prefer the negative pressure behind to the positive in front. For my own part, I would rather have a suction pump where the gas goes into the delivery main, running a suction pipe to the works, than have a big force pump at the works." Such is the disagreement of opinions among the learned. Working out the problem by D'Arcy's formula, it would seem as if Mr. Shelton's conclusions were right; but there are a number of things which enter the question which clearly do not enter into D'Arcy's formula.

* See "JOURNAL" for April 8, p. 891.

A New Jersey Project.

An equally daring project is now in view in New Jersey. Estimates have been asked for as to pumping machinery to transfer various amounts of gas through pipes of various sizes for a number of miles. An expert recently said to me: "We will furnish the machines to do the work according to their specifications; but we are not going to write the specifications." Among the compressed air men, a doubt exists as to the effect upon the gas. Some of them are evidently making experiments; and they do not seem at all satisfied with their results. One man said to me: "It is my firm belief that this change in method is bound to come; but I do not think we are quite ready for it. However, if you will not mention my name, I will tell you all that I imagine will follow if this thing's success equals its promise." This is what he said, reduced to monologue. "Yes; I read about it. The reduction in candle power is a wise move; and it has not come one minute's time too soon. There is no sense in making gas with high flame luminosity; but, while they can, who shall blame the United Gas Improvement Company for trying to make people think so? Why, I took 15 per cent. out of the candle power of my gas for three days last month, and did not have a single complaint from anyone except a chemist, who said that he noticed the change because he had a photometer. Oh, gammon! I tell you that I can make that thing lie like a policeman. The only test of any value is the calorimeter. Yes; I understand that. But if we can reduce the price faster than we reduce the calorific power, and do only reduce price just as fast as we reduce the calorific power, then we are gainers. Mr. Livesey put it right when he said if the reduction of candle power was once begun, he would not undertake to say where the process will stop; but I will. It will stop when we are furnishing the gas that we find it best to make, and not one minute before. We cannot force the use of mantles, but we can penalize the open flame; and, the United Gas Improvement Company notwithstanding, we will. Does it not seem wonderful that in less than a month the attitude towards this system should so alter. I am only wondering now when it is going to stop. Yes; I firmly believe that non-luminous blue gas can be made in great quantities at the mines, and sent under pressure through long lines of pipes, as, indeed, I suggested some time since. I think, if the practice of pumping gas is proved to be feasible—and I doubt not that it will be so proved—that the whole district from Pittsburg and Buffalo on the west, to Boston, New York, Philadelphia, and Baltimore on the east, will be supplied from one single huge station erected at the coalfields."

At this turn in the conversation, I suggested that there was ample cannel coal, if they want to use it, by going a little further south; and it seemed to me he was going too far in assuming that all the gas of the future was to be of the non-luminous type. To this he made an easy answer: "What do you think we are going to make gas for, to light rooms with? If you do, you are not in it. We are going to make gas first of all to drive engines. If people want to use it for lighting, they must use the skirt. No mantle, no light. That is the terms on which gas will be sold right here in New York fifty years from now." "This is really a transition period in the industry, as every year has in a measure been since gas was first made. We do not really know what a day will bring forth; but you may be sure of this—that there will be no more building for the future on our present lines. We will be more, much more, conservative than we have been, because we are now beginning to understand how rapidly the changes may come. Mantle? Yes; that began it. Then the boom in the day load caused by the stoves and engines. No, as the man in London said, we will not be tied to any standard except the daily changing standard of the daily need." For an American engineer—and a prominent one—to be so positive an opponent of the great American fancy was rather a poser; but he gave me some information (which I cannot use) which is more surprising still.

Another New Gas-Furnace.

During my peregrinations, I have seen another new injector furnace—new to the inventor, new to those who have seen it, and to whom it has been described. It consists of a blast of "superheated air mixing with superheated gas in a mixing-chamber, into which is thrown a heavy spray of the heaviest fuel oil obtainable." The quotation is from the patent specification.

This furnace looks like a series of cones of fire brick built up from the floor, is about 3 ft. 6 in. high, 1 ft. 6 in. diameter at the top, and 2 ft. diameter at the bottom. The outer cone is of the size given, and is about 1½ inches thick. Over this, when in use, fits a jacket of combed asbestos wool, to keep in the heat. Inside this is another cone, about 18 inches diameter outside and also 1½ inches thick, both standing on a brick platform. The inner cone is about 2 feet high, and has the same taper as the outer one. A spider to support the crucible tops this cone; and above this, coming to within 6 inches of the top, is a straight pipe, forming the fire pot for the crucible. In the inner cone, about half way up, is a sort of diaphragm of fire-clay, of conical shape. The inner cone is open at the top to receive the crucible, and the outer cone is covered. The smoke (*sic*) flue opens between the two cones from the floor, and enters a chimney, which "draws like a team of army mules" [This is not from the patent.], drawing air through a checker in the foundation, up through the inner cone, and down through the outer one. If desired, this air passage can be closed air tight; and it is said to be useful chiefly to

"deaden the fire," which it does by cooling the furnace gases. Between the two cones are two cast-iron worms—one supplying air, the other gas—which naturally get very hot soon after the fire is started. The gas and air mix in the lower part of the furnace, and burn above the diaphragm. Terminating in the middle of this hole is the end of an injector for throwing the fuel oil (made very fluid, if not vaporized, by the heat) mixed also with heated air, straight upward as a spray. This supply of oil and the air are automatically proportioned; the air coming from the same reservoir as that which goes through the coil previously mentioned. Both air coils are in the outer space, as are also two turns of the oil-pipe.

When the furnace is first lighted, the lower checker draft being opened, the conditions are those of a bunsen flame above the diaphragm. By proper management of the supplies of air from the two pipes, and of gas and oil, a wonderful heat has been obtained in the fire-pot—so intense indeed that union of the carbon and oxygen of the air is said to have ceased. Cyanide of potash has been made by direct combustion; and a number of beautiful experiments have been shown. Platinum is easily fused in this furnace; and a crucible of quicklime showed evidence of incipient fusion. With the exception of the Moissan furnace, it was the highest temperature that we had any of us seen; and apparently larger amounts of force have been disengaged here than in any other combustion furnace built anywhere else.

Naturally, one asks why such a machine has been constructed. But this the inventor, a Mr. Nichols, will not tell. In answer to the question: "What are you going to do with it?" he has so far replied: "Play with it, until I am weary of my toy, and give it to the School of Mines." As Mr. Nichols has found out some queer things about the behaviour of various substances at high temperatures, we who know him are on the look-out for some unexpected developments—probably in the chemistry of silicon and iron. Should he develop some new thing, his position may change from the unimportant one which he now occupies; being neither nephew nor niece's husband to his employers, to one represented by a name instead of by a number. There is something of the tragic as well as of the comic in the situation of these "brainy beggars."

Gas under Pressure.

During the past winter a man in Iowa has been making experiments on the influence of pressure in causing the combination of gases. His efforts are rather confused, as he does not seem to have troubled himself with much study of the *status quo* of his problem at the period when his experiments began. At the same time, he has gathered up some valuable data. His first results are shown by the following quotation from a letter he has written to me. "We are using as a motive power in our small shop a Nash gas-engine, and we have always found it very satisfactory as a machine. But it has a way of getting dirty—in other words, the gas we are using (a mixed coal and water gas) does not burn up clean. It occurred to me that it would be interesting to study the method of the combustion of the gas. From the study of the indicator diagrams, I made up my mind that the gas did not explode at all, but that the combustion was in a sense quite slow. That is, in my opinion, the name 'combustion engine' is very much more suitable than 'explosion engine,' the name we commonly use. So I fixed up a gas-engine of special design, in which the pressure would be so managed that I could let part of the gas mixture out of the cylinder into a vacuum at any part of the stroke—that is to say, in the first inch or any other inch as I liked.

"It seemed to me that if the gas exploded, or if all the gases in the mixture began to burn at the same time, the composition of the specimen thus taken from the cylinder at the end of the first half inch or inch of the stroke would not differ much, if any, from that taken in the last, except that it would contain more air and more gas. But the amounts of water and carbonic acid would be just the same. On the other hand, if, as I believed, the hydrogen burned first, then the hydrocarbons went to pieces, next the hydrogen of the hydrocarbons burned, and (finally) the carbon-monoxide, I should have different results according to the part of the stroke in which my specimen was removed. This can be expressed in various ways; but I think you understand me. At first I was troubled by the gas continuing to burn after I let it out into the air; so I expanded it into the vacuum. This chilled it so fast that only a very little, if any, burned.

"The results of my experiments seem to me to show that I am, if not right, at least on the right track; and I am going to try it again and again until my results seem to agree. Then I shall publish my result. This much I certainly know already. My general notion is quite correct, the free hydrogen burns first; but only a very small part of the carbon monoxide burns with it. All the hydrogen is, I think, burned out in the first 1-20th of the stroke—in fact, I think it really explodes; but the carbon monoxide is not all burned until near to the end, when the engine is working at full load. I think the higher numbers in the hydrocarbons go to pieces slowly, splitting off carbonic acid each time. I cannot tell you exactly what happens, because I am only just learning the conditions of experiment; but I have begun now, after working for three months, at the point where I should have begun at first.

"I am now trying mixtures of hydrogen and carbon monoxide alone; and my results are beginning to become quite uniform. So that I can give you two facts you may like to know. The whole of the hydrogen burns out of the mixture before the carbon monoxide takes fire, except a very little; and when working the engine on this mixture with a full load, the whole of the carbon monoxide has not burned at the end of the first quarter of the stroke."

These statements are interesting; and I for one shall wait with some curiosity for a monograph. He sends me a sketch of his "pump and valve apparatus." It is certainly most ingenious, and, I believe, quite reliable. It would be very curious if at this late day any new facts are to be found out in relation to gas-engines. He names the parts of the stroke in such a way that his other results seem abstract; so it is better to wait. But he insists that graphitic carbon begins to form the instant any hydrocarbon higher than marsh gas gets into the cylinder. He says: "I can burn all the carbon out of methane in a mixture with hydrogen and carbonic oxide; but if I add any acetylene, my results show that the carbon has not all burned up, and it is the same if I had benzol. This also must make smoke."

It is interesting indeed to note how, little by little, the items are coming in which are needed to clear up some of the many confused problems in the chemistry of illuminating gas. These experiments may possibly show why some explosions have so very large a dynamic and so small an incendiary effect, or the exact reverse. In the admirable series are articles going through publication in the "Journal," many of these have been as it were answered by implication, while others have been totally ignored. If the hydrogen does actually burn out of a mixture of the illuminating gases without igniting the others, it makes many things plain; and we are certainly right in saying that perhaps the difference in the diffusion rate may count for much.

TECHNICAL RECORD.

THE SUMMER MEETING OF THE SOUTHERN DISTRICT ASSOCIATION.

The Summer Meeting of the Southern District Association of Gas Engineers and Managers on Thursday was a brilliant success, due equally to the excellence of the programme and the beauty of weather and locality. Nothing could have been more acceptable, or better suited to such an occasion, than the arrangements made for the day's outing in the charming region of the Thames Valley which has for its three significant points Richmond, Kingston, and Hampton Court. The labour and anxiety of seeing to the local preparations for the entertainment and amusement of the expected party of about fifty visitors naturally fell upon the President of the Association, Mr. W. E. Price, the Engineer of the Hampton Court Gas Company; and he is to be congratulated upon the result of his exertions in the interest of his appreciative supporters. A warm acknowledgment is also due to the hospitality and personal friendliness of the Directors of the Company, who not only entertained the party to a handsome luncheon served in a marquee erected in a field adjoining the gas-works, but mustered in force, with the Secretary (Mr. W. C. Lamb), to receive as guests the professional colleagues of their esteemed chief executive officer. Members journeyed to Richmond by early trains, and were met at the railway station by brakes which conveyed them through the busy little town, up the historic Hill, past the renowned Terrace Gardens and the famous view over the river which is one of the glories of England, and so into Richmond Park. Passing White Lodge, the old home of the Princess of Wales, the route taken was through Kingston, where a passing glimpse was obtained of the Coronation Stone of the Saxon Kings, and across the Thames to Hampton Wick, where the first portion of the drive ended at the gas-works. Here a little time—not too much—was allowed for the inspection of the works, which, like most establishments of the kind, are being remodelled and modernized to meet the requirements of a growing district—a residential district, moreover, in which nothing of the character of an eyesore or a nuisance would be pardoned. Here in due course, as already mentioned, luncheon was given by the Directors; the chair being taken, in the absence of the Chairman (Mr. R. J. Kent), by the Deputy-Chairman (Mr. A. Goodman).

After luncheon, the drive was resumed through the chestnut avenue of Bushey Park—already past its seasonal glories—to the Hampton region of Metropolitan water-works, reservoirs, and pumping-stations. Here a halt was first made at the magnificent new structure of the Southwark and Vauxhall Water Company, splendid in white brickwork, and full within of glistening machinery, sending water all the way to the Nunhead reservoir of the Company. The new pumping plant, by the North-Eastern Engineering Company, is of the type of the latest triple-expansion, inverted cylinder marine engines, with surface condensers, in 400-horse power sets; the steam being supplied from a battery of Babcock and Wilcox water-tube boilers working at 200 lbs. pressure. Comparison could also be made between these and the older beam pumping-engines of the Cornish type, supplied from Lancashire boilers. At the neighbouring station of the Grand Junction Water-Works Company, there was yet another variety of pumping machinery to be seen, in the shape of one of the largest Worthington sets in existence, together with a very fine array of other horizontal tandem engines and pumps. This

grand display of pumping plant on the largest scale, installed and worked with all the completeness and thoroughness of engineering style which is honourably characteristic of the London Water Companies, furnished the members of the Association with a deeply interesting lesson in the progressive development of steam engineering from the cylindrical boiler working at a pressure of 50 lbs. and the simple engine doing all its work in one cylinder, to the forced-draught water-tube steam generator, with its gauge steady at 200 lbs., and multiple-expansion engines. It is not only in the Navy that the question of boilering is a pressing one at the present time; and it is no small advantage for any engineer and factory manager to have the whole steam-raising problem laid out before his eyes, with all its leading factors, in one grand collection of pumping works ruled only by the single consideration of efficiency. Nothing could exceed the urbanity and willingness to impart their experience which were displayed by the respective officers of the works visited. The occasion was altogether one to be remembered.

From the pumping-stations of Riverdale, the party returned to Hampton Court Palace; and after spending a quiet hour in that pleasantest of places, had high tea together at the Mitre Hotel—best of riverside hostelries—before dispersing greatly satisfied, one and all, with their day.

WESTERN (U.S.A.) GAS ASSOCIATION.

Annual Meeting at New Orleans.

The Twenty-fifth Annual Meeting of the above-named Association was held at New Orleans, on the 21st ult. and two following days, under the presidency of Mr. THOMAS D. MILLER, of Dallas, Texas. The introductory business having been disposed of, the President read his inaugural address, in which he dealt with many matters of practical interest to his colleagues. The address was not printed, and therefore the subjects touched upon must be left for another occasion. There was a fairly good list of papers; and several items in the "Wrinkle Department" and the "Question Box." There were 31 additions to the roll—25 ordinary, and 6 associate members; and two of the latter class were transferred to the former. The election of officers resulted as follows:—

President.—Mr. A. H. Barret, Louisville, Ky.
First Vice-President.—Mr. F. H. Shelton, Philadelphia, Pa.
Second Vice-President.—Mr. O. O. Thwing, St. Louis, Mo.
Secretary and Treasurer.—Mr. J. W. Dunbar, New Albany, Ind.
Editor of Wrinkle Department.—Mr. W. E. Steinwedell, Belleville.

The social functions included a banquet at the West End—a famous summer resort about seven miles from the city, on Lake Ponchartrain—and a trip on the Mississippi River. One of the pleasant features of the meeting was the presentation to Mr. O. O. Thwing, Superintendent of Station B. of the Laclede Gas Company of St. Louis, of a solid silver table set, costing about $500, in recognition of his services in editing the volume of proceedings of the Association. A drawback to the pleasure of the meeting was the intense heat which prevailed; but everything possible was done to ensure the comfort of the members by Mr. F. H. Shelton and Mr. Bankson Taylor, of the New Orleans Lighting Company, and their assistants, especially on the occasion of the visit of the members to the Company's works in the afternoon of the second day. We give below some of the shorter papers submitted at the meeting, and the rest will be noticed in due course.

THE LATEST ABOUT INCLINED RETORTS—GLEANINGS FROM ABROAD.

Mr. F. EGNER, of Morristown (N.J.), gave the meeting the latest information about inclined retorts, from particulars obtained during his recent visit to Europe. The following are some extracts from his communication.

On starting out upon this journey, the first intention was to visit nearly every works where the inclined retort was used; but after going to a number of successful works, this idea was abandoned, as it seemed to be a sinful waste of time and money. The operations were so much alike at each works inspected—so far as the work of the inclined retorts was concerned—and also considering that the number of inclined retort works had increased from a comparatively few to 76, with 8087 retorts in setting, with an estimated daily capacity of over 106,050,000 cubic feet, that the point above mentioned, may be seen to have been well taken. For the figures just given the writer is indebted to the "JOURNAL OF GAS LIGHTING." He was extremely well received and treated on all occasions, by the British and Continental gas engineers whom it was his good fortune to meet on his trips abroad.

The writer has seen numbers of fine gas-works—many real novelties and examples of good management in Europe as well as in America; but he cannot admit that we are one little bit behind them in anything whatsover, except in the adoption of such a self-evident labour and money saver—a thing of interest to working men and capitalists alike—as is the inclined retort system. Englishmen cannot understand it; and some of them who are men of much experience in the subject have come over to United States to see if they can do business with us in that line—as Humphreys and Glasgow did—by the introduction of water gas into Europe. For one thing, our people have regarded the inclined retort too much in the light of a specialty, when, in fact, it is nothing of the sort, although a number of patents have been granted for various portions of the improvements.

Having been asked many questions in the past about inclined retorts, let me now ask you in general one or two. Why, in the name of common sense, should not retorts be set in a suitable oven at an angle of 32° from the horizontal, which is the best adapted for successful working with the system under consideration? Will not the retorts, if thus set, have a tendency to slide into the fire-room? Of course they will, if you do not provide against the contingency. They do not slide, if properly braced; and if the writer had not given way with his opinion to that of his then President, and to the then agent of the manufacturing company who furnished the benches without knowing anything about them, the first large installation of inclined retorts in the United States would have been a success instead of, as they were, a failure twelve years ago. That omission had nothing to do with the underlying principle of the inclined retort.

Why should not the inclined retort be evenly heated? Well, have you never seen horizontal retorts which were *not* evenly heated? The writer has lots of them. And it is the same with the inclined retort. Given a properly designed bench, and experienced or sensible management, there is no difference between horizontal and inclined retort benches in that respect. Let me ask you, and you ask yourselves, why should there be any difference? Is there really any good reason for one? The writer knows of not one; and he has had quite a respectable lot of practical experience with coal gas works, great and small.

"The whole secret of the successful working of any bench is the heats." This was said to the writer only a few weeks ago by Mr. James Husband, the Engineer and Manager of the Brentford Gas Company, when again visiting at one of the large works under his management, after having been there five years before. There is probably no more successful manager of gas-works anywhere than is Mr. Husband. He succeeded Mr. Frank Morris, whose assistant he had been for years, and who himself is still one of the Board of the Company named. The latter introduced the system at the Company's works, and was afterwards thanked by his Board for the economies in production brought about by it.

At the works named, they have only inclined retorts—48 benches of sixes and 26 benches of sevens. The retorts are 20 feet long, ⌂ shape, tapering 21 in. by 16 in. at the upper, and 24 in. by 16 in. at the lower end. The producer furnace is about 2 ft. 6 in. by 5 ft. at the grate surface; and the charges are run for six hours—the weight per charge being 700 lbs. per retort. Partly in consequence of this, Mr. Husband seldom, if ever, has any stopped pipes. Four men do all the work of charging and discharging eight benches. Of course, the coal is brought in by machinery, and the coke hauled away in waggons. The working space at the front and back of the benches is not abnormal, though retort-house and coke-yard are under one roof. These men seemed to be not overworked by any means; and Mr. Husband remarked that the independence from labour troubles alone would more than compensate one for employing the system, if there was no saving in other directions; but this there was.

The Edinburgh and Leith Gas Corporation have, through their able Engineer and Manager, Mr. W. R. Herring, just about completed a model gas-works at Granton, a suburb of the cities named. There they have 56 benches of nines; the retorts being 20 feet long, ⌂ shape, 22 in. by 15 in. in section. One of the features of these works is the novel charging device, the invention of Mr. Herring. By means of it, it is no exaggeration to state that after the charging shoot is set before the retort, a child of six could place a charge of 600 to 800 lbs. of coal into a retort inside of five seconds; the charge being as even and level as it would be possible to put into a horizontal retort with the most experienced hand labour.

The Corporation have other works, at each of which they have a few benches of inclined retorts, and a great many served by stoking machinery. The new works are supplied with inclined retorts only, after carefully conducted trials by men experienced in the handling of stoking (and the best at that) machinery—disinterested men, who could, however, not afford to make a mistake when building the new works mentioned. Almost the same remarks would apply to the Corporation gas-works at Leeds, where there are three stations, all of considerable magnitude; only they have as yet no water-gas plant as they have in Edinburgh, of the Humphreys and Glasgow type, which gives general satisfaction. But they are about to instal some apparatus of the kind also at Leeds. Mr. R. H. Townsley, the General Manager of the Leeds Gas Corporation, is popularizing the use of gas among the working classes with great success; and as Leeds is a city of over 400,000 inhabitants, he finds it necessary to erect a new retort-house, which will be furnished with benches of inclined retorts. They have now the Foulis and West stoking machinery, with inclined retorts, and one works with inclined retorts only.

The most all-round interesting gas-works ever seen by the writer were those of the Crystal Palace District Gas Company, where Mr. Sydney Yarrel Shoubridge is the very efficient Engineer. Here they have inclined and horizontal retorts, with West's stoking-machines, water gas, sulphate works, complete shops for making and repairing meters and gas-stoves, machine shops and foundry, and a brick yard. Eight men attend to 10 benches of sevens; and Mr. Shoubridge stated that the same men could attend to 15 such benches. The retorts are 20 feet long, made in

three pieces, with flat "butt" joints, ⏢ shape, 21 in. by 16 in. at the upper, and 24 in. by 16 in. at the lower end. They charge 700 lbs. of coal every six hours per retort, and the heats are very even and good. They are building a new retort-house for inclined retorts with bricks made by otherwise idle retort-house stokers, from clay dug from what is going to be a new gasholder tank, which the Company propose to erect next year, may be. The brick-making machinery is driven by a gas-engine, and as there is a great outside demand for the quality of brick made by Mr. Shoubridge, they sell at a net profit of 10s. per 1000 all they can turn out and do not require themselves. They make red and yellow brick, and also all the fire-brick blocks and tiles they need. They have not yet essayed the making of retorts; but Mr. Shoubridge seriously thinks of doing it.

Among all the gas-works in England where the inclined retort system has been adopted, there is one—the Old Kent Road works of the South Metropolitan Gas Company—which is to be reconverted to the horizontal retort system. This fact will, no doubt, be made much of by those whose interest makes them opponents of the inclined system. But let me assure you all that the reason of this reconversion is not at all one of greater supposed utility of the one over the other system, but is done entirely as a matter of shrewd business policy of merely local application. The full reasons were explained to the writer. But as the above statement covers the facts in the case, and the policy being a local one, not intended by its author for present publication at least, we must let it go at that for the present.

Six-hour charging seems to be a general rule in England as also on the Continent. While they do not force heats as is done in America, and consequently do not suffer from stopped ascension pipes in the same degree as many there do, it is still a debatable question as to which is the best practice. In my own mind, the opinion prevails that we err on the high as European engineers do on the extreme low degree of heats.

It may be as well to say a few words on the question which has been frequently asked: What about the cost of erecting, maintaining, and repairing inclined as compared with horizontal retorts? Here again let me appeal to your own good common sense, first calling attention to the fact that as one bench of inclined retorts is about the same as would be two benches of horizontal retorts back-to-back, this should be borne in mind when making such comparisons. Then, why should such a bench of inclined retorts cost more? There will be one hydraulic main, one set of ascension-pipes, and one furnace less than would be the case with the horizontals of equal approximate capacity. The bench will be higher, but also much shorter for a like length of retorts. And why should not retorts which are not subjected to the pounding and abrasion of drawing rakes and scoops last longer, and cost less for repairs, than do horizontal retorts which are subjected to these disadvantages? The claims made by those who are using inclined retorts, that they cost less for repairs than horizontals, must appeal to your own reasoning powers as being likely to be substantiated in fact. If your works are not large enough to warrant elevated coal-bins and machinery, you can rig up a barrow walk and platform instead, and then anybody able to roll a wheelbarrow with coal can charge the retorts, so that the expense of charging apparatus may be eliminated if you like.

Gasholder Specifications.

Mr. H. A. Carpenter, of Allegheny (Pa.), read the following paper on the above subject.

The rapid increase of the gas business in America, and the consequent general use of large storage holders, is sufficient reason for the growing interest shown of late by many of our gas engineers in the design of such holders. Steel is used to-day as the backbone of the greatest ventures in every class of structures; and the consideration of the amount and shape of metal necessary to render these structures permanent and lasting is receiving more attention as the application has increased.

In preparing for a new holder, generally the first point to be decided is whether it shall be of the steel tank or masonry pit type. In reference to this subject, we have frequently heard the assertion that a masonry pit, if properly constructed, is lasting. Now I will make the same assertion regarding a steel tank. We have known of steel tanks that have failed; but one need not be very diligent in hunting the records to find similar troubles with masonry pits, and no doubt the cause of the trouble was the same in either case—faulty design or workmanship or a combination of such deficiencies.

Comparative estimates of the costs show almost without exception a material advantage in favour of the steel tank; and this fact has probably been the cause of the general adoption of this type of gasholder. There are, however, many other important advantages in favour of the steel tank, some of which I will enumerate.

This type of holder is more quickly and easily constructed than a masonry pit. By the application of ordinary means, it has been possible to construct a large holder, foundations and all, with a steel tank 210 feet in diameter by 33 feet deep, between the 1st of March and the 1st of October in the same year. More than double this time would be required to build a similar sized holder with masonry pit under the most favourable conditions. In some cases, the conditions are so unfavourable that it is practically impossible to build a satisfactory masonry pit, no matter how much money you spend. But, on the contrary, a suitable foundation for a steel tank can be constructed under practically any condition at a reasonable cost. There is no more important consideration in this comparison than that the steel tank holder properly designed is a self-contained structure, avoiding the foundation-bolt connection necessary for the guide-framing in the case of the masonry pit.

The material used in a large steel tank for a gasholder should be of basic open-hearth steel, of an ultimate tensile strength of from 52,000 to 62,000 lbs. per square inch, an elastic limit of at least one-half the ultimate tensile strength, and should stand a bending test cold, flat on itself, without fracture on the outside of the bent portion. If the plates are manfactured at some of the largest mills, there is little chance of the material not being properly worked; but if heavy plates are purchased from the smaller mills, there is danger of getting plates unfit for the sides of the tank, even though the manufacturers produce satisfactory test specimens cut from each plate. In order to avoid such trouble as this, and to ensure uniformity of material in the plates for the tank shell, it may be well to specify the number of reductions from the size of the original ingot to the finished plate, and to provide for the rejection of 20 per cent. of each ingot of the top portion of the casting. Carrying this point a step further, the engineer might require that the original ingot should in every case be very much heavier than the finished plate, worked first on a slabbing mill to approximate the required weight, then reheated, and finished to the desired thickness.

A gas company's money could not be better spent than by increasing, over the ordinary practice, the factor of safety to withstand the bursting pressure in the case of large steel tanks. A strain not to exceed 12,000 lbs. per square inch of metal in the least section of the plate at the riveted joint would be very desirable. This point should be carefully taken care of, and the specifications so drawn that the strain specified cannot be interpreted to refer to the gross section of the plate.

Too much attention cannot be given to the necessary shop and field work in connection with a steel tank for a large gasholder. It is safest to require, as far as the tank shell is concerned, that all holes shall be drilled from the solid plate, and that the edges of all plates shall be planed. The plates should be carefully formed, and the holes connecting them so accurately spaced as to require practically no reaming in the field to make them fair. Hammer-driven rivets in the tank shell should be avoided as far as possible. It is very desirable that the rivets in the tank shell should be driven with a compression riveter, and in case it is necessary to replace any loose rivets, they should be removed by drilling, not cut out with a sledge.

As far as the lifts of the gasholder itself are concerned, it would occupy too much time to attempt to cover the subject thoroughly. I will therefore simply remind you of some of the more important points. All cup and grip plates, as well as top and bottom courses of the various holder sections, may well be kept heavier than they are ordinarily constructed, in order to withstand corrosion longer. My impression is that it would not be amiss, with buyers of holders, to establish a minimum thickness of $\frac{1}{4}$ inch in these particular plates.

The light sheets of the holder shells and crown are generally made too thin. The money would be well spent if nothing lighter than No. 10 B.W.G. were used. It is best that these light sheets should be box annealed, as this process removes all the mill scale, and allows the first coat of paint to adhere, while open furnace annealing (the usual practice) makes more scale, which gradually rusts loose. The life of the holder shells may be greatly increased by careful attention to painting the exterior. Paints mixed with linseed oil are not desirable, because this oil is very porous, and readily absorbs water. In specifying the allowable working strains in parts of the holder, it will be best to provide that the bursting strain in the crown and compression in the top curb of the inner section shall not exceed 12,000 lbs. per square inch of the net section of metal, and that the sheering strains on the rivets involved shall not exceed 7500 lbs. per square inch.

In the guide-framing of the gasholder, very particular attention should be paid to arranging the various members so that all parts will be accessible for cleaning and painting. Connections between members involving rivets in tension should be avoided. In specifying the load for which the frame shall be designed, it is better to express the amount in pounds per square foot of diametrical section of the holder at its full height than in a gale of a certain velocity in miles per hour, as the former method leaves no possible question as to the load.

Beaumont Oil for Gas Making.

Mr. John H. Fitzgerald, of Houston, Texas, dealt with the above subject. In the course of his remarks, he said: The chief marvel in connection with the subject of my paper is the colossal producing capacity of the Beaumont oilfield. To-day, but sixteen months after the initial discovery, the number of wells has gone far beyond the 200 mark. These wells have an easy average capacity of 30,000 barrels per day. It will thus be seen that the combined capacity of all the wells is 6 million barrels in 24 hours, 180 million barrels for a month, and 2180 million barrels for a year.

After Jan. 10, 1901, when the great Lucas gusher was brought in, about the first thing it suggested to those in the gas industry was what effect it would have on the business, and its probable

value for gas making. The first reports sent out from the field were that it was a fuel oil, pure and simple, and had very little value for gas making or refining purposes. Later tests, however, have proved so satisfactory, that until now we have used the Beaumont oil for making water gas.

After more than a year's experience with this oil, I feel justified in stating that it has a gas-making value or efficiency equal to from 85 to 88 per cent. of the Eastern oil. I will say, however, that owing to the different nature of the product, and the difference in the treatment required, it is doubtful if any of the users have, until very recently, obtained results that would justify this assertion. To explain this, I will say, that I have no bar photometer; and therefore have no means of making exact tests of the candle value of the oil; but judging from the jet photometer passing the mixed product, I believe it to be from 5 to 5·25 candles per gallon per 1000 cubic feet. From one or two other places where Beaumont oil is being used, I found, upon inquiry, that they were getting about the same results, or approximately 5 candles per gallon per 1000 cubic feet.

About the 1st of February this year, a well-known operating and constructing company sent their expert operating engineer to New Orleans for several weeks, and later to Galveston, Texas; and the results obtained by him not only bear out this statement, but actually surpass it—he having obtained an average of 5·9 candles per gallon. This goes to show what is attainable under good conditions and competent manipulation. The gas is slightly weaker and is more sensitive to low temperature, and will part with more illuminants by condensation. Owing to an excess of sulphur, the cost of purification is somewhat increased—perhaps 15 or 20 per cent. In making the gas, it will deposit more carbon on the checker brick in the carburettor, and requires a lower temperature in the superheater than Eastern oil. A high temperature in the superheater will convert the light oil fractions into lampblack, and also produce naphthalene in quantities both aggravating and expensive.

The following is an analysis of Beaumont oil by Mr. E. P. Schoch, of the University of Texas, in January, 1901. The oil was from the Lucas well, temperature 60° Fahr., sp. gr. ·916.

Deg. Fahr.	Per Cent of Yield by Volume.	Colour.
212 to 320	1·78	Clear white.
320 ,, 410	6·41	Light straw yellow.
410 ,, 464	6·88	Deeper ,, ,,
464 ,, 500	12·14	Deep yellow.
500 ,, 680	18·65	Light red brown.
Above 680	44·64	Dark brown.
Residue	4·24	—
Loss	5·26	—

Note.—At 311° Fahr., a white sublimate (probably sulphur) appeared in the condenser; at 338° Fahr., sulphuretted hydrogen fumes were quite strong; and from 572° to 662° Fahr., there was scarcely any distillate.

This was one of the first analyses made of the oil, and the results have been confirmed by many analyses made since. The specific gravity ranges from about ·9210 to ·8974, equal to 22° to 26° Beaumé. Some different samples of the oil have developed B.T.U. as follows: 19,060 (working test), 19,574 (laboratory test), 19,785 (do.). Mr. W. B. Phillips, Director of the University of Texas Mineral Survey, in a letter recently published says: "In the laboratory of this survey we have made many analyses of the Texas oils, and have determined the sulphur with extraordinary care. We found that. in the Beaumont oil, the sulphur varies from 1·75 to 2·4 per cent.; the average being 2·09 per cent.

GAS PRODUCERS WITH WOOD FUEL.

At the last meeting of the Iron and Steel Institute, Dr. James Douglas, of New York, submitted a paper on the working of a gas-producer with wood fuel, either for driving gas-engines or for metallurgical purposes. The author more particularly described a power-gas plant in use in Mexico, which is designed after the Loomis down-draught principle, once familiar in connection with the inventor's attempt to manufacture power gas from bituminous coal. This Mexican plant comprises a pair of Loomis gas-producers, with a boiler between, which is intended to utilize the sensible heat of the gases. There is no essential difference between the modified Loomis water-gas plant and others; but when the fuel is wood, the abundance of moisture in it obviates the necessity of injecting any steam into the charge. The fact of the draught being downwards through the producer, moreover, while the apparatus is fed with fresh fuel from the top in the ordinary way, is described as operating to distil all the tar, and decompose all other vapours in the mass of incandescent fuel, so that only a trace of such impurities reaches the purifiers. The great point is, of course, to avoid the formation of cavities and channels through the mass of fuel. This particular plant appears to work equally well with any sort of coal or wood that happens to be available. Whether the fuel is anthracite, bituminous coal, or wood, the efficiency of the gas in the engines is substantially the same. The calorific power of the gas is also much the same, ranging from 120 to 140 B.T.U. per cubic foot at 67° Fahr., and at sea-level. The wood gas is of different composition from the coal gases made in the same producer; being high in carbonic acid and hydrogen, and low in carbon monoxide. In this respect it resembles Mond gas; but it is reported that no inconvenience results from the interchange of such gases in the engines,

EXTRACTION OF NAPHTHALENE FROM GAS BY WASHING.

The following is an abstract translation of a recent communication on this subject by Herr R. Lieberknecht, of Bremen, to the "Journal für Gasbeleuchtung."

The purification of coal gas from naphthalene by washing according to the process of Messrs. Young and Glover* has lately been introduced in many works. The question of the cost of this system in comparison with the older method of abstracting naphthalene by means of properly constructed condensing plant, has thus been brought into prominence.

The washing process consists in the absorption of the naphthalene present in the gas by a heavy coal-tar oil, mixed with 3 to 4 per cent. of benzol. According to Dr. Bueb's experiments, this oil takes up about 10 per cent. of naphthalene. It answers best with only slightly cooled gas; and therefore Dr. Bueb recommends that this treatment should take place, along with washing for the recovery of cyanogen, after only moderate atmospheric cooling of the gas has been carried out. He gives the cost of oil for the treatment at from £5 10s. to £7 per million cubic feet of gas. But it should be mentioned that the charges for labour and power for the washer, and for depreciation, have to be added to this amount.

The alternative process, which aims at separating the naphthalene along with the tar, has been developed and promulgated through the labours of Herr Salzenberg, Professor Bunte, Herr Kunath, and many others. It may be accepted as proved that, with condensing plant devised for the purpose, and properly arranged, the naphthalene almost completely disappears from the gas. In order to attain this consummation, the gas must be very gradually cooled down, so that most of the tar is deposited from the gas while it is still quite warm. Sudden and large differences of temperature are to be avoided.

This end is very well attained by an arrangement which has lately been adopted at the recently constructed Woltmershausen Gas-Works, at Bremen, according to the plans of Herr Salzenberg. There are immediately above the hydraulic main two superposed, slightly inclined, simple condensing cylinders, having a few open wire grids, for promoting the separation of tar from the gas while still warm. The gas passes from these cylinders into a main which leads to the condensing plant proper. The gas must be guarded from sudden cooling; and hence this main is insulated where it passes through the open air. The condensing plant must consist mainly of atmospheric condensers, in order to ensure gradual cooling of the gas; and only the final cooling must be effected by means of water. At the Woltmershausen works, the gas is passed from top to bottom to and fro through only slightly inclined pipes within a condenser-house; and only when it reaches the lowest tier of all is it passed direct into water.

In small works, a substitute for this condensing in the warm could be provided by arranging the collecting or foul main directly over the hydraulic main, and making it of very ample dimensions. The cooling plant will then, in effect, consist mainly of atmospheric condensers, and only at the last of water condensers. If the dimensions are very ample, complete separation of the naphthalene can be counted upon. Such, at least, is the experience in many cases.

The greater cost of plant entailed by this condensation and cooling, compared with the cooling required with the Young and Glover process, is by no means inconsiderable; but the interest and depreciation charges thereon are nevertheless less than the expenditure would be on oil for the latter process. For example, a works making about 70 million cubic feet per annum, and therefore having a maximum day's output of about 350,000 cubic feet, would, according to Dr. Bueb's figures, expend £40 to £50 per annum for anthracene oil; while the cost of the naphthalene washing plant might be estimated at £100. Interest at 4 per cent., and depreciation at 7½ per cent., make up the cost of naphthalene purification for a year to £51 10s. to £61 10s., exclusive of the cost of power and wages. But if the same works deal with the naphthalene according to the old process, the plant for condensing in the warm would entail, at the most, an additional outlay of £50 per setting of eight or nine retorts, or (say) £300 for the aforementioned make, including settings in reserve. Interest at 4 per cent., and amortization at 5 per cent.—which is reasonable, because of the simplicity of the apparatus—amount to an annual charge of £27. Hence the old process affords an economy of about £25 to £35 per annum, without taking account of the cost of power and labour for the naphthalene washers, the fluctuations which may take place from time to time in the price of oil, and the dependence on chemical works. The latter factor is of importance with a plant which serves for the whole production.

The annual economy is very much greater in the case of quite large works. The power required, though small, entails a considerable expenditure. It is to be observed that, in small or medium-sized works, the supervision of the naphthalene washer by means of distillation tests throws a new burden on the officials, while the simple extended cooling of the gas requires neither more attention nor more supervision.

* See "Journal," Vol. LXX., p. 588.

THE CONSTITUTION OF GAS OILS.

At a recent Meeting of the Manchester Section of the Society of Chemical Industry, a paper on the above subject was submitted by Mr. R. Ross, F.I.C., and Mr. J. P. Leather, of Burnley. The following extracts therefrom, taken from the Society's "Journal," will be of interest in connection with the paper to be read by the latter gentleman at the meeting of the Gas Institute this week.

In the month of November, 1900, the Corporation of Burnley commenced to use carburetted water-gas plant, constructed for them by the Economic Gas Apparatus Construction Company. The plant, on a 24-hour test with Russian oil, gave the following results: Quantity of gas made, 1,218,300 cubic feet; amount of oil used, 3304 gallons, or 2·71 gallons per 1000 cubic feet; average illuminating power of gas, 22·12 candles, or 8·16 candles per gallon; amount of coke used, 39,741 lbs., or 32·34 lbs. per 1000 cubic feet.

As these results rather more than complied with the representations of the builders, they were considered eminently satisfactory, and indeed they continued to be so as long as this class of oil was in use. The following year a quantity of Borneo solar oil was purchased. On commencing to use this, an immediate and very considerable diminution in both the quality and quantity of the gas produced was observed. Besides this, after a short period of working, it was noticed that the quantity of tar made had risen to an enormous extent. The change of oil had brought about a fall in the gas production of about 600 cubic feet per run, or a loss of about 38 per cent. calculated on the amount of gas actually produced by the oil, and likewise a reduction in the candle power of about 30 per cent. in proportion to the quantity of oil used.

Of course, the temperature at which an oil is cracked has a very considerable influence on the quantity and quality of the resultant gas. During the previous season we had carefully determined the best temperature at which to work the Russian oil by means of an electrical pyrometer, and at first the Borneo oil was worked at the same temperature—viz., 1200° Fahr. at the centre sight-cock. The result with Borneo oil, as already mentioned, being unsatisfactory, other temperatures were tried, both lower and higher, proceeding in the latter direction till somewhat violent explosions were obtained on every opening of the stack-valve. These temperatures were, of course, carefully controlled with a pyrometer. No improvement—in fact, rather an opposite result—was obtained by these variations of temperature. We therefore directed our attention to the chemical composition of the oil, and found that, on fractional distillation, it yielded results differing very materially from those given by Russian oil; and that, although the Borneo oil has the higher specific gravity, it had a lower boiling-point, and also its refractive index was very much higher than that of Russian oil. In order to better understand these results, we determined to investigate the matter more completely, and to include in our investigations the four principal oils on the market—viz., Russian, American, Borneo, and Texas, the latter being quite a recent importation. We laid out our preliminary plan on the following lines: (1) Fractional distillation. (2) Quantity obtained in each fraction. (3) Specific gravity of the fractions. (4) Refractive index of each fraction. (5) Bromine absorption of each fraction. (6) Gasification of the oil on a laboratory scale. (7) Analysis and density of the gas obtained from the oil. [The first results obtained were those under headings 1, 2, 3, 4, and 5, and they are set out in tables given in the paper; Nos. 3, 4, and 5 being graphically arranged on a diagram.]

An examination of the results showed us that, though all the oils (with the exception of Russian refined) began to boil at about the same temperature, Borneo oil practically all distilled over at a temperature within the range of a mercurial thermometer; whereas the other oils distilled at considerably higher temperatures in the following order: Texas, American, Russian, the last containing the highest boiling fractions.

Next taking the gravities into consideration, and comparing fractions of the same boiling-point, we found that the gravity of the Borneo is the highest, and that the oils gradually decrease in gravity in the following order: Texas, Russian, American. But perhaps the most striking difference is to be noticed in the refractive indices which were determined in these instances for the sodium line.

Comparing fractions of the same boiling-point, Borneo oil has by far the highest refractive index, and American the lowest. Russian oil is distinctly higher than American; the difference decreasing with elevation of the boiling-point. Texas, though nearly approximating to Russian at the lowest boiling-points, rises more rapidly than Russian in the higher boiling fractions; thus showing that it occupies a place intermediate between American and Borneo with respect to its refractive index.

Having indicated the methods they employed and described the apparatus used for the gasification of the oil on a laboratory scale, the authors proceed as follows: The method upon which we finally worked was to crack 15 c.c. of oil at a temperature of 1350° Fahr., and collect the gas. The reason why we chose this temperature was that experience with the carburetted water-gas plant showed that this was the best temperature to be maintained at the point where the oil entered the carburettor. In addition to analyzing the gas, we determined its density, and from this we calculated the weight of the gas produced, and by difference the percentage of loss which we classify as tar. The following table sets forth the results of this series of experiments. Each is the average of at least three experiments; and after some few determinations we had no difficulty in obtaining concordant results:—

—	Russian Solar Oil.	Borneo Solar Oil.	American Solar Oil.	Texas Solar Oil.	Russian Refined Oil.
Quantity of gas per c.c. of oil, corrected to N.T.P.	465·7	301	442·6	397·4	429
Density	0·833 Grm.	0·765 Grm.	0·885 Grm.	0·737 Grm.	0·775 Grm.
Weight of gas made per c.c. of oil	0·502 Per Ct.	0·298 Per Ct.	0·506 Per Ct.	0·388 Per Ct.	0·430 Per Ct.
Tar by difference	42·5	67·0	40·5	57	47·9
Analysis of Gas.					
Hydrocarbon vapours	4·0	4·0	3·2	3·4	3·8
Heavy hydrocarbons	30·2	22·8	33·0	26·8	28·0
Methane	54·2	60·0	52·5	56·2	57·0
Hydrogen	12·0	13·6	11·6	13·4	11·5

The results shown above for Russian and Borneo oils are in accordance with those obtained from the use of these oils with the carburetted water-gas plant on a large scale, both as regards the make and quality of the gas and also the amount of tar produced. From the table, it is evident that practically similar results are obtained by the use of Russian and American oils, and also that in the case of Borneo oil nearly 70 per cent. is incapable of gasification at this temperature. We will deal with this more fully when we give our views on the probable constitution of the oils. Meanwhile, it is to be noted that Texas occupies a middle place. It will be seen that the chief variation in the composition of the gas obtained is in the heavy hydrocarbons; and, since the illuminating power of the gas is dependent on the quantity of hydrocarbon vapours and heavy hydrocarbons, we would suggest that an approximate valuation of an oil for gas-making purposes can be made by multiplying the number of cubic centimetres of gas produced from 1 c.c. of oil by the sum of the hydrocarbon vapours and heavy hydrocarbons.

The following table gives the results obtained in this way for the five oils examined:—

Nature of Oil.	Number of c.c. of Gas Obtained from 1 c.c. of Oil.	Percentage of Hydrocarbon Vapours + Heavy Hydrocarbons.	Product.
Russian solar	465·7	34·2	15,927
Borneo solar	301·0	26·8	7,067
American solar	442·6	36·2	16,022
Texas solar	397·4	30·2	12,001
Russian refined	429·0	31·8	13,642

Basing the values of the oils on these figures, we find that American and Russian oils are practically of identical merit, and that Russian refined, Texas, and Borneo oils follow in the order named—the latter being less than half the value of the two first-named oils. It is, of course, quite possible that by working at different temperatures somewhat better results might be given by some of the oils. This we believe might especially apply to Russian refined, and we hope at some future time to give further results definitely answering this question.

We have endeavoured, and we believe with some degree of success, to calculate the approximate composition of each of the oils we have examined. This we have done by means of a careful consideration of all the constants obtained. At the same time we do not feel justified, in the present state of our investigation, in doing more than indicating the nature of these deductions, reserving any definite statements till such time as the work we now have in hand either confirms or corrects our present impressions.

The following statements embody in a general form the deductions which we have drawn in regard to the approximate composition of the oils we have examined: American solar oil probably contains paraffins and olefines in about equal quantities, and only a very small percentage of any closed ring compounds. Russian solar oil we regard as consisting largely of paraffins, with a comparatively small proportion of olefines and naphthenes—the former being in excess of the latter. Borneo solar oil, according to our methods of deduction, consists almost entirely of naphthenes and olefines; the percentage of paraffins being very small, especially in the higher boiling fractions. The proportion of olefines in it, however, gradually increases with the boiling-point.

It is thus quite possible that, by a series of experiments, some means might be devised whereby an oil could be obtained from the Borneo fields of much greater value than the present one for gas-making purposes. Texas solar oil occupies, as regards naphthenes, a place between Borneo and Russian, differing however, from Borneo in that it contains a considerably larger proportion of paraffins, and thus it is a much better oil for gas-making purposes.

CONSTRUCTION OF PURIFIERS.

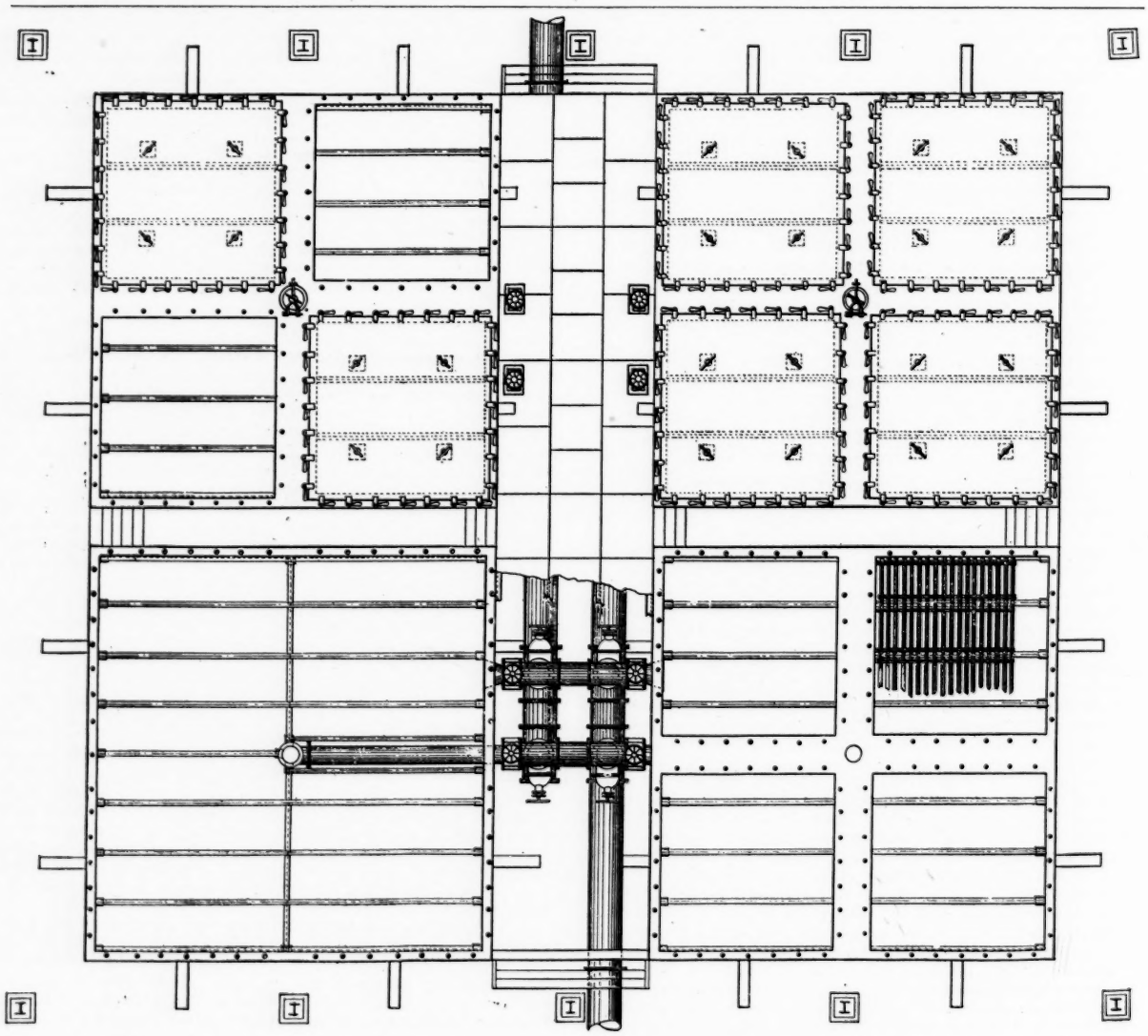
An Improved Form in Expanded Metal and Cement.

At the recent Annual Meeting of the Western Gas Association in New Orleans, of which a notice appears in another column, one of the papers read was entitled "Current Purifier Practice and a New Form of Construction." The author was Mr. F. H. Shelton, of Philadelphia, who explained that his purpose was to briefly review purifier construction practice in the United States, and describe an easily made form for ordinary boxes which, under certain conditions, would reduce the cost of construction to the extent of one-half. In dealing with his subject, he first reviewed the usual practice, past and present, of constructing purifiers; then described the variations in the ordinary forms, and indicated those proposed but not yet adopted; and finally explained the form he proposed as a standard. With the usual types of purifiers described and illustrated by the author, most of our readers are familiar. With regard to those not yet adopted, he first cited a continuous treadmill arrangement patented by Messrs. Goodfellow and Sabbaton, of Troy (N.Y.), in 1873, where a stream of gas was fed against a stream of oxide upon an endless chain. He next called attention to the system proposed by Herr Klönne in 1880—a vertical arrangement of inclined trays on a tower purifier up through which the gas would flow, and down through which a continuous zigzag column of oxide would slowly work, it being removed at the base by a water-sealed worm screw. Three years later (on Dec. 25, 1883), Mr. Henry C. Rew, of Chicago, planned a vertical lime purifier with tilting or dumping trays. Early in 1890, Mr. Wallace C. Andrews, who was then President of the Standard Gas Company of New York, also designed a box with dumping trays. His idea was to have a shower of lime through which the gas would pass; and he built a tall scrubber-like vessel, 40 feet high, in the Company's works, to try the effect. The arrangement was an entire failure in practice, owing to clogging and for other reasons. Seven years later, Mr. Shelton conceived the idea of a "four-deck" or quadruplex purifying box, with dumping trays, to save ground space, cost of construction, &c.; and he described it in a paper read at the meeting of the American Gaslight Association.* Subsequent reflection, however led him to the conclusion that his plan was too complex, and that, though ingenious, it did not produce a perfect box. The following year (1898), Mr. Henry G. Beatley, of Marquette, Mich. described, in a paper submitted to the Michigan Gas Association, a closed purifying vessel in which oxide was fed continuously against a stream of inflowing gas, though, as far as the author was aware, it had never been constructed on a working scale. Mr. Shelton then proceeded to introduce the subject of his cheap form of purifier, as follows.

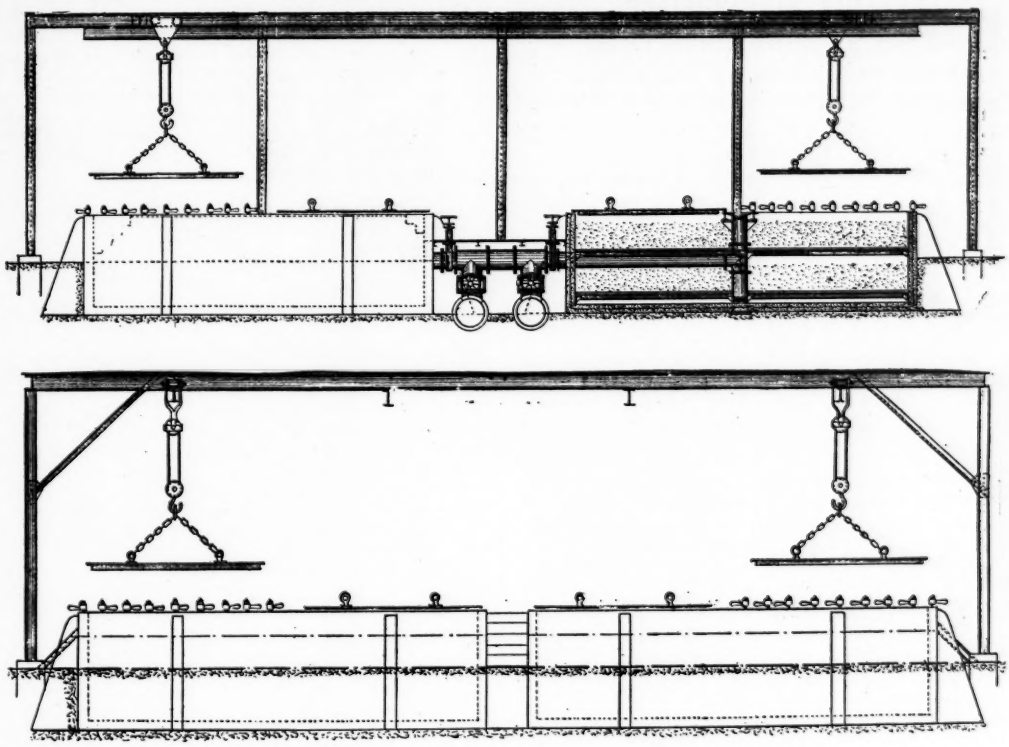
Coming down now from the history of the past, the variations of the present, and sundry propositions for improving the future, it is without doubt true that, after all is said and done, the rectangular box, connected as one may prefer, is the standard prevailing type. Any method of building this, whereby the usual expense is cut in half, can but be of interest. I will end by briefly describing four boxes, 25 feet square and 7 feet deep, of the Beale two-oxide-tier divided-stream form, with the Green type of dry-lute gasket lids, which I am now preparing to build for the New Orleans Lighting Company. The boxes are four in number, set in a square, half below the ground level, half above, as shown in the diagrams.

The chief feature of novelty is that they are made of cement bottom and sides, 6 inches thick, instead of the usual cast-iron machined plates. The cement is run in between proper mould boards, between which, and imbedded in the bottom, are sheets of expanded metal or sheet-steel webwork that bond all together. Light pilasters are provided outside, although it is expected that without them the walls would be entirely self-contained. The coefficient of expansion and contraction is the same for cement and iron; and the result is that in this class of work such bonded cement walls contract or expand without cracking. The adhesion of the cement to the bonding sheets is also greater than to itself. The tops edges of the sides of the boxes are capped with a 6-inch channel-iron inverted, to take wear and tear, &c., and to form a flat surface for the gaskets; and 1-inch bolts project every 20 inches, to which are fastened swivel dogs or cams, with taper under

* An illustrated description of this purifier was given in the "JOURNAL" at the time. (See Vol. LXX., p. 1175.)



PLAN OF FOUR CEMENT PURIFIERS (25 FEET BY 25 FEET BY 7 FEET) WITH DRY LUTE COVERS.



Elevation and Section of Four Cement Purifiers (25 Feet by 25 Feet by 7 Feet), with Dry Lute Covers.

sides. The top of the box is spanned by a sheet-iron walk-way on iron beams, bisecting the 25-feet box each way into four squares. The lids to cover these four openings are each about 11 feet square, simply ¼-inch iron, with angle-iron run round the edges, and a couple of T-irons across, to stiffen. It is obvious that a very light lifting load results, compared with the usual 26-feet deep trussed cover.

When the lids are lowered in place, the cams are turned partly into place by hand. The workman then walks round the box with a mallet, knocking each one farther into place; and the resulting wedge action on the edge of the lid compresses the rubber and makes a gas-tight joint. This rubber gasket may be ½ inch by 1½ inch section, or half oval, like a carriage tire—either form working well. It is prevented from adhering to the box by a little graphite rubbed on, and it is cemented to the under edge of the lid, so that when the latter is lifted, it carries the gasket with it, away from shovels, boot-heels, &c.

The gas is carried by the inlet-pipe into the centre of the box to a stand-pipe from which it emerges top and bottom. This pipe makes an excellent centre-post in the box, and support for the cover framing and walk-ways; it being remembered that the fixed cover, with movable 11-feet hatchway lids, is to a large extent the working floor. The stand-pipe also affords excellent support to the oxide trays bearing-bars, which are of the usual arrangement; the outer ends being carried by lugs bolted to the cement sides. A 24-inch main serves the set of boxes. A 12-inch feed supplies each box, and this stream is in turn divided, each half having a bed of oxide about 2½ feet deep by 25 feet square for purifying. One, two, three, or four boxes can be used; and the order can be reversed, or any one cut out. Sixteen 12 and 16 inch valves control the whole, and being of small size they are unlikely to get out of order. I figure the capacity of the set as from 3½ to 4 million cubic feet per 24 hours. The construction is easy on foundations; the load per square foot being light. The boxes rest on the earth; all under beams, columns, and connections being avoided. The necessary pipe connections are very simple.

A set of ordinary boxes 25 feet square and 7 feet deep erected in New Orleans would cost from $20,000 to $25,000. The usual two-storey brick building and other work would raise the expense to $35,000. These boxes are housed in a one-storey pavilion structure 60 ft. by 70 ft.; and the total cost of it and the cement construction and other work will be probably a little less than half of $35,000.

It is obvious that the oxide can not be shovelled through the bottom of these boxes. It will be removed by shovelling into large iron dumping buckets hanging, by light chain blocks, if necessary, to a little trolley on an overhead rail; forming a continuous track over and from the boxes to the adjoining oxide shed, and return. These tip-buckets, as filled, are pushed by hand to the shed and dumped; an empty one meanwhile coming in on the return rail to the men shovelling in the box. This system is very simple, cheap, and effective, and involves practically no repair account and no hoisting of the oxide to a second storey. It has lately been put into the new works at Zurich, Switzerland,* and is in use in many German works.

The use of cement as above described is merely a definite practical application to gas-purifier purposes of a class of construction now well established. The Monier sysiem (wire rods imbedded in and bonding cement) abroad, and the extending use of expanded metal and cement construction in America, practically eliminate the question of experiment. And one can, moreover, go back to old purifiers, half depth in the ground, built with brick walls like a brick gasholder tank, as shown in "Clegg's Treatise on Coal Gas" fifty years ago, and find closely allied construction. But the particular working out of the boxes as at New Orleans, in connection with the Green dry-lute lids, is, as a whole, unusual.

INCLINED RETORT WORK IN AMERICA.

The information which has recently come to hand, that the partisanship of the inclined retort system in the United States has of late been considerably strengthened, and that the system will be much more favoured there in the future than in the past, invests with interest any intelligence which reaches England as to the constructional details of the work (of small extent though it be) so far carried out, and of the trend of the fancy of our American gas engineering friends in this regard. They have had the benefit of the experiences in success and failure on this side; and now they have a good range of selection before them. It is abundantly clear from a beautifully printed pamphlet that we have received, through the kindness of Mr. Frederic Egner, that the Laclede Fire-Brick Manufacturing Company are doing some excellent work in this line. The pamphlet contains several illustrations of inclined retort work, proposed or representative of some that is being actually executed. Believing that a reproduction of a few of these illustrations will afford interest for English gas engineers, we have taken the liberty of drawing upon them. [See next page.]

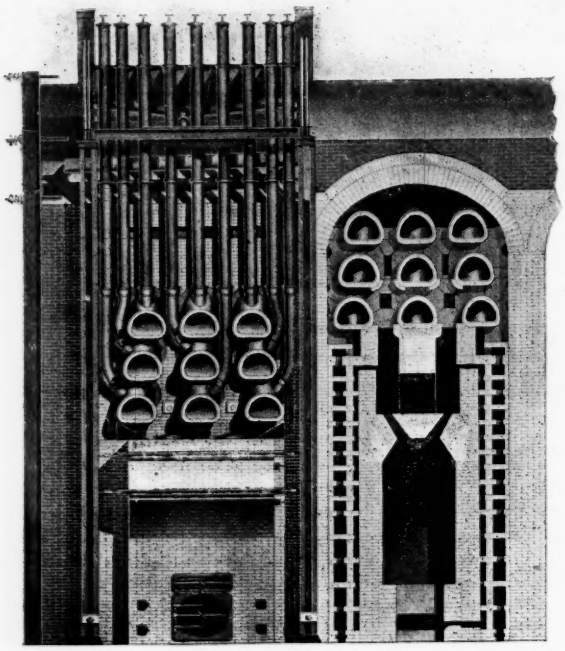
In the first set of illustrations, we have a vertical transverse section, a rear and front elevation, and a vertical longitudinal section of a setting. These illustrations are representative of the settings which have been in use at Louisville, Kentucky, since July, 1900; and they are giving, Mr. Egner informs us, entire satisfaction. The retorts are 18 feet long, and taper from 26 in. by 16 in. at the lower end to 22 in. by 16 in. at the upper end. The bench is built with arches 8 ft. 6 in. wide between the pier walls.

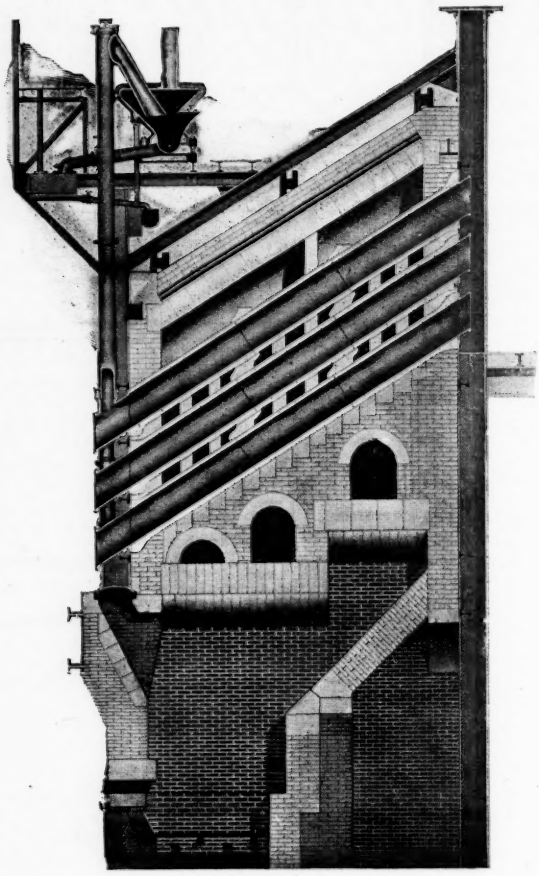
The second set of illustrations shows a front elevation, and also a vertical transverse section and vertical longitudinal section of a setting. This is an example of the type of settings now in course of erection at the works of the Central Union Gas

* These works, it may be remembered, were fully described in the early numbers of Vol. LXXVII. of the "Journal," and the description has been reprinted in pamphlet form.—Ed. J.G.L.

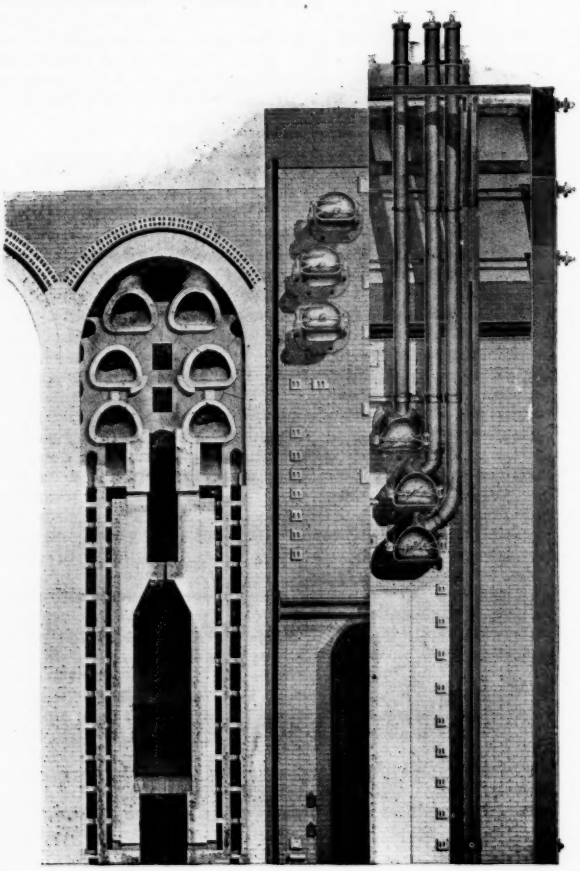
Company, which is a branch of the Consolidated Gas Company. The retorts are of the same section as those at Louisville, but will follow the now generally adopted practice in England, and be 20 feet long. The front stage is 13 feet, and the rear stage 24 ft. and 27 ft. 6 in. above the ground-line. These settings, Mr. Egner tells us, are to be matched against similar settings of nines of the Stettiner Chamotte Fabrik type.

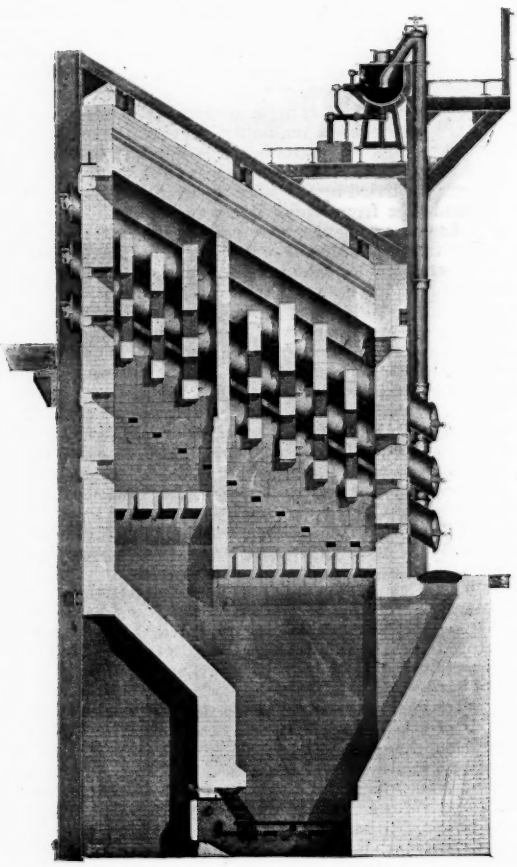
We hope that our American friends will keep their English colleagues apprised of what they are doing, and are proposing to do, in connection with the inclined system. They will find from time to time in these columns ample to engage their interest as to work that is done in this country and on the Continent. There was a splendid example last week from Berlin.





RETORT-SETTINGS AT THE CENTRAL UNION GAS COMPANY'S WORKS, NEW YORK.





RETORT-SETTINGS AT LOUISVILLE, KENTUCKY.

WATER GAS MANUFACTURE IN THEORY AND PRACTICE.

By Dr. James Kramers.

[Abstract Translation of a Communication published Last Year in "Het Gas."*]

(*Continued from p.* 1496.)

Recapitulation and Theoretical Consideration of the Run.

Summarizing the results of the foregoing discussion, it may be said that:

Firstly. The reaction $C + 2H_2O = CO_2 + 2H_2$, according to Lang, begins below 600° C. This reaction is not reversible below 1000° C., as CO_2 and H_2 do not act on each other below 1000° C. (Naumann and Pistor). It follows, therefore, that if H_2O be passed slowly enough over incandescent C, the H_2O must entirely disappear. No undecomposed steam need therefore occur in water gas, provided the rate of flow of the steam be well chosen.

Secondly. With a rise in the temperature, the appearance of CO can be explained according to the reaction $CO_2 + C = 2CO$. The question is whether this is the only explanation, or if, at a higher temperature, the reaction $C + H_2O = CO + H_2$ may not be assumed to occur directly.

Against this latter view, it must be said that when care is taken to have no excess of steam, the action of steam on C and of CO_2 on C is almost alike. This would be explained if the same reaction took place in respect of the CO_2 in both cases. This would, in fact, happen if it were granted that the steam is first decomposed according to the equation $C + 2H_2O = CO_2 + 2H_2$, whereupon $CO_2 + 2H_2 + C = 2CO + 2H_2$ becomes perfectly comparable with $CO_2 + C = 2CO$. In the first case, there is merely an independent amount of indifferent H_2 present, just as in the second case an independent amount of (for example) indifferent N can be added, as was actually done by Lang. Furthermore, if it be granted that the reaction $C + H_2O = CO + H_2$ takes place, then, in order to explain the presence of CO_2 in the final product, it must be assumed at the same time that either the reaction $C + 2H_2O = CO_2 + 2H_2$ or the reaction $CO + H_2O = CO_2 + H_2$ occurs. Therefore it follows, according to the one explanation, that

$$C + 2H_2O = CO_2 + 2H_2 \ (a), \quad CO_2 + C = 2CO \ (b),$$

and, according to the other explanation, that

$$C + H_2O = CO + H_2 \ (c), \quad CO + H_2O = CO_2 + H_2 \ (d).$$

By (*a*) and (*b*) everything is explained, and equations (2) and (3) are separately followed. This is not the case with reactions (*c*) and (*d*). The former has never been separately authenticated. It is certain if this reaction occurs, it is not reversible; for no one has been able to make CO and H_2 act on one another below 1000° C. to form H_2O. Therefore, if it occurs at all, it takes place quantitatively. The fourth (*d*) does likewise. Thus it is probable that, in consequence of (*d*), so large a quantity of CO_2 will be formed that it will be necessary to fall back on the reaction $CO_2 + C = 2CO$, in order not to obtain a mixture which at all temperatures will contain an equally large proportion of CO and CO_2. Besides, reaction (*a*) has been established at low temperatures; and it has not only never been proved that this reaction would be maintained at high temperatures, but it is *per se* very improbable. In the first explanation, only two reactions which are well known have to be accepted; while in the second explanation, besides (*c*) and (*d*), (*a*) and (*b*) are required, or four reactions against two. Granting that with an excess of H_2O, reaction (*d*) is not excluded, yet there is no need to accept (*c*), for it is a universal rule to accept intermediate reactions only when either the intermediate state can be demonstrated, or when the reaction is necessary to afford a rational explanation. Here, as neither the one nor the other is the case, (*c*) may be rejected and placed in the category of possibilities, instead of proved facts.

Thirdly. The reaction $CO_2 + C = 2CO$ begins at ± 600° C. It is probably reversible (Lang), so that for every temperature there will be an equilibrium. This equilibrium alters as the temperature rises, so that at ± 1000° C. there is still present ± 4 per cent. CO_2 on the total quantity of CO_2 + CO. It will thus be impossible, if the generator is not hotter than 1000° C. at the point where the gases are last in contact with the fire, to obtain a lower percentage of CO_2. Referred to all the constituents of water gas, this is ± 2 per cent. CO_2.

If Lang's results are correct, and the curve obtained according to his experiments for the action of CO_2 on C joins the curve obtained from Harris's experiments for the action of H_2O on C, and assuming, moreover, that for the whole process equilibrium was established in both cases (which, however, is not probable), then supposing it were decided to work at no higher temperature than 800° C., about 70 per cent. of CO_2 to 30 per cent. of CO would result; and the composition of the gas would be about 63 per cent. H_2, 11 per cent. CO, and 26 per cent. CO_2. This gas would not yield 2000 calories per cubic metre (225 B.T.U. per cubic foot), and, on account of the high percentage of CO_2, would be quite useless for lighting with incandescent mantles. If the CO_2 could be removed cheaply, this gas would render excellent service.

Fourthly. In default of proof to the contrary by reliable researches, Naumann and Pistor's contention that $CO_2 + H_2$ do not react to a measurable extent between 600° C. and 1000° C. must be accepted. Thus, at these temperatures, the reaction $CO + H_2O = CO_2 + H_2$ is not reversible to an appreciable degree; and therefore, given sufficient surface of contact and sufficient time, would proceed entirely in the direction shown.

That the reaction $CO + H_2O = CO_2 + H_2$ does not take place below 600° C., and between 600° and 1000° only or almost only from left to right, but at higher temperatures also from right to left, could therefore be explained thus: Below 600° C., the vibrations or the movements of the atoms in the molecules of CO_2 and H_2O are not large enough to cause them to split up; but they afterwards become large enough to admit of a splitting up of H_2O, if helped by the attractive power of the CO molecule, so that CO_2 can be formed, and H_2 be left. Much greater movements (higher temperature) are required to split up the CO_2 also, under the influence of the attractive power of H_2 for oxygen. According to this explanation, we should have:

(*a.*)—That below 600° C. arbitrary quantities of CO_2, CO, H_2O, and H_2 exist indefinitely in juxtaposition.

(*b.*)—That between 600° C. and 1000° C. (Hoitsema takes 1750° C.) the reaction results in an almost complete conversion into CO_2 and H_2, so far as the quantity of H_2O is sufficient for it.

(*c.*)—That at every temperature above 1750° C. a definite equilibrium is established, which gives way when the temperature changes, but recovers with a return to the first temperature.

Therefore, whenever between 600° C. and 1750° C. an H_2O molecule is split up (under the influence of CO), a molecule of CO_2 is formed, and a molecule of H_2 remains over. Thus the number of molecules of CO_2 and H_2 always increases, and that of H_2O and CO molecules decreases. This cannot be otherwise, even when allowed to go on until not a single molecule more of H_2O can be found. It will be made more clear by formulæ.

To split up a molecule of H_2O, a CO molecule must be present, as the dissociation of H_2O by itself at this temperature (600° – 1750° C) can be left out of consideration. Supposing that there is only 1 molecule of H_2O in 1 litre of the mixture, then the chance that this molecule will meet a CO molecule is proportionate to the number of CO molecules there are in 1 litre of the mixture. Let this number be represented by m. If there are more molecules of H_2O (*e.g.*, n) per litre, then every H_2O molecule will have this chance, and n molecules have thus an n times greater chance. The number of H_2O molecules, which, in fact, are converted in a unit of time according to $CO + H_2O = CO_2 + H_2$, is evidently proportional to the chance that 1 molecule of H_2O is split up in the unit of time, and taking care that while the concentration proceeds m and n remain unchanged (by always adding just as many molecules of H_2O and CO as are converted) then the number p of molecules that are converted in the time T can be expressed by:

$$p = m \times n \times k \times T, \ (25),$$

in which k is a fixed co-efficient, dependent on the kind of molecules, on the temperature, &c. This co-efficient is termed the velocity of the reaction. The minute is taken as the unit of time for these calculations, m and n are expressed by the number of gramme-molecules per litre, or, what is the same, the number of kilogramme-molecules per cubic metre. Supposing in the formula (25) m and n and also T are equal to 1, then k will signify the number of gramme-molecules that are converted in a minute, with a degree of concentration of the gramme-molecule per litre, on the supposition that this concentration is kept unchanged for one minute.

If the concentration be not kept constant, then the formula remains correct for a very small period of time. The number of converted molecules can be infinitely small, or δn, which the concentration of the H_2O undergoes in the infinitely small time δT, and thus, if the concentration be not kept constant there is obtained at any moment this equation:

$$\delta n = m \times n \times k \times \delta T \ (26),$$

in which m and n represent the concentration for that moment. The negative sign of δn is explained thus: That δn in general represents a change; $+ \delta n$ an increase; and $- \delta n$ a decrease. Therefore, (26) can also be written:

$$-\frac{\delta n}{\delta T} = m \times n \times k \ (27),$$

which is a differential equation. By the integral calculus a relation can be deduced from this between the number of n' H_2O molecules, which will still remain after a certain time T, if the concentration be not kept constant. For this is found:

$$\text{log. nat. } T\frac{n.\,m'}{m.\,n'} = (m - n)\ k\ T \ (28).$$

m' is the number of CO molecules which will still remain, and can be found from the proportion

$$n - n' = m - m' \ (29$$

* The author has used throughout chemical symbols in place of the names of elements and compounds; and though such use is open to serious objection, and is contrary to our usual practice, it has been retained *for the sake of brevity* in this translation.—Ed. J.G.L.

inasmuch as just as many molecules of CO disappear as there are molecules of H_2O split up. The equation (28) becomes much simpler if it be assumed that $m = n$—that is to say, if equal molecular quantities of H_2O and CO be made to act on each other. The equation (27) then becomes:

$$\frac{\delta n}{\delta T} = n^2 k \quad (30),$$

and from this is found the much simpler equation:

$$\frac{1}{n'} - \frac{1}{n} = k\,T \quad (31)$$

By the formulæ (28) and (31), the value of k can be determined by experiments, without the necessity of keeping the concentration constant, which would be practically unworkable. From equation (31), we find:

$$n' = \frac{n}{n \times k \times T + 1}, \quad (32),$$

from which we learn that theoretically n' will never be *nil;* as for that $n\,k\,T + 1$ would have to be infinitely large; and that would only be the case for an infinite value of T—that is to say, only after an infinitely long time. It was therefore correct to say that not a single molecule of H_2O will remain, provided time enough is allowed. Theoretically, however, it is an infinitely long while before all the molecules are converted; but in a relatively short time the number of unconverted molecules will have become very small. For this, we should have to calculate a value of k; and this can hardly be done from the researches made up to the present in this direction. An endeavour will be made to do it; but it must first be observed that, owing to very many of the data being assumed, the number obtained for k will not be very reliable. It will therefore be given wholly under reservation.

As data for calculating k, an experiment of Naumann's will be taken, in which he found that a mixture of CO and H_2O, after being passed once through a tube heated to 1000° C., contained 10 per cent. of CO_2. He does not give the time in which a certain quantity was collected, nor the width of the tube; and these figures must, therefore, be assumed from other of Naumann's experiments, and must thus be uncertain. Assuming, then, that in 5 minutes he collected 100 cc. of the mixture, and that the tube was 8 mm. wide (as in his experiments on the reduction of CO_2 by incandescent carbon) and 60 cm. long, it can thence be calculated how long the mixture was heated to 1000° C. The tube was filled with pieces of pumice stone; and supposing that these occupied about half of it, then a simple calculation shows that the mixture passed through the tube at the rate of about 80 cm. per minute, and that therefore the length of the tube was traversed in $\frac{3}{4}$ minute, so that the mixture was exposed to the temperature of 1000° C. for $\frac{3}{4}$ minute. Supposing that the mixture originally consisted of 50 per cent. CO and 50 per cent. H_2O, there would be 1 gramme-molecule of CO and 1 gramme-molecule of H_2O to 44·64 litres; so that the original concentrations expressed in the accepted units would be $\frac{1}{44{\cdot}64}$ for both CO and H_2O.

After the mixture had been passed through the tube, it contained 10 per cent. of CO_2; therefore 40 per cent. of CO and 40 per cent. of H_2O; and the concentration of H_2O was only $\frac{0{\cdot}8}{44{\cdot}64}$. These are all the data for calculating k; and from equation (31) we find:

$$k = \frac{1}{T}\left(\frac{1}{n'} - \frac{1}{n}\right) \quad (33)$$

Filling in the values found for T, n', and n, we have:

$$k = \frac{1}{0{\cdot}75}\left(\frac{44{\cdot}64}{0{\cdot}8} - 44.64\right) = 14{\cdot}88.$$

Let us now use the value found for k, to calculate how much steam will remain after—*e.g.*, 10 minutes—when a mixture consisting of 80 per cent. of CO and 20 per cent. of H_2O is exposed to a temperature of 1000°C. We must now use formula (28), as the quantities m and n differ. The calculation shows that there will only be 0·276 per cent. of H_2O remaining, or not 0·3 per cent.; and thus it appears that, although theory demands an infinitely long time for the completion of the reaction, yet after 10 minutes only so little will remain over that practically it can be neglected.

As already stated, the value found for k does not pretend to be correct, as the data were uncertain. Those who wish to determine experimentally the value of k, should pursue the course indicated above. It would be a very meritorious work, especially if at the same time the reaction $CO_2 + C = 2\,CO$ were taken up also. For this latter reaction, however, other formulæ are required, as at the temperature in question there is probably a reversible reaction, and equilibrium would be established.

To give an idea of the result of a reversible reaction in this connection, the reaction

$$CO + H_2O \rightleftarrows CO_2 + H_2$$

will be considered at higher temperatures. The splitting up of H_2O, as when the reaction proceeds from left to right, takes place under the same conditions as above—*i.e.*, if m and n are the concentrations of CO and H_2O, then we have again

$$-\frac{\delta n}{\delta T} = m \times n \times k \quad (27).$$

The formation of H_2O evidently depends on H_2 and CO_2 coming together; and if the concentrations of these latter be called q and r, then

$$-\frac{\delta q}{\delta T} = q \times r \times k \quad (34).$$

So long as the one reaction gets the better of the other, the percentage of H_2O will increase or decrease. Yet after a time, as the chance for the reaction which is getting the better continually decreases, and the chance for the other reaction continually increases, there will necessarily be a moment when the chances become equal, and thus exactly as many molecules of H_2O will be split up as are formed. There is then an equilibrium and

$$-\frac{\delta n}{\delta T} = -\frac{\delta q}{\delta T} \text{ or } m \times n \times k = q \times r \times k'$$

which can also be written

$$\frac{k'}{k} = K = \frac{m \times n}{q \times r} \quad (35).$$

In this K is termed the constant of equilibrium.

If K is known for various temperatures, the composition of the mixture can be predicted for those temperatures. Starting with equal known quantities—*e.g.*, m gramme-molecules of CO_2 and H_2—then the equation will be:

$$K = \frac{(m - x^2)}{x^2},$$

from which x can easily be found thus:

$$x = \frac{m}{1 + \sqrt{K}}. \quad . \quad . \quad . \quad . \quad (3)$$

In this way the percentage of CO at a particular temperature can be determined. An approximate value for K has been found by tracing the composition of a mixture, consisting of known quantities of CO and H_2, after it had been exploded in a closed space, with a known quantity of oxygen insufficient for complete combustion. The oxygen was distributed between the hydrogen and the carbonic oxide, so that after the explosion there was a mixture of H_2, H_2O, CO, and CO_2. It must be assumed that at the moment when the explosion took place, an equilibrium was established between the four constituents. It can be ascertained by analysis how much of each was present, and thus all the data are obtained for calculating K. K appertains to the temperature to which the mixture was raised by the explosion; and this can be calculated approximately from the known specific heats of the constituents and from the heats of combustion of H_2 and CO. To calculate K, it must be assumed that the composition does not change appreciably during the cooling. This is not quite certain; but seeing that the cooling takes place very quickly, equilibrium will probably be only very slightly deferred. Moreover, dissociation of H_2O and CO_2 must be neglected, even though very high temperatures will have come into play. However that may be, it has been shown in this manner, with more or less probability, that there is a temperature at which K reaches a maximum—that is to say, it decreases at both a higher and a lower temperature.

The results which Hoitsema obtained from Horstmann's experiments are shown in the next diagram by crosses, thus (+). The theoretical reasons for this maximum must be sought in the variableness of the specific heat with the temperature. From theoretical considerations a formula can be found, expressing the change which K undergoes with a variation in temperature. This formula is:

$$\delta \log.\,\text{nat}\,K = \frac{q}{2T^2}\,\delta\,T, \quad (37),$$

in which q depends on the specific heat of the components of the mixture.

In order to be able to compare the figures given later with figures found by Luggin, a value for q is assumed, calculated from data, differing somewhat from the values already assumed for the specific heats of H_2, H_2O, CO, and CO_2. The difference is, however, small. Thus:

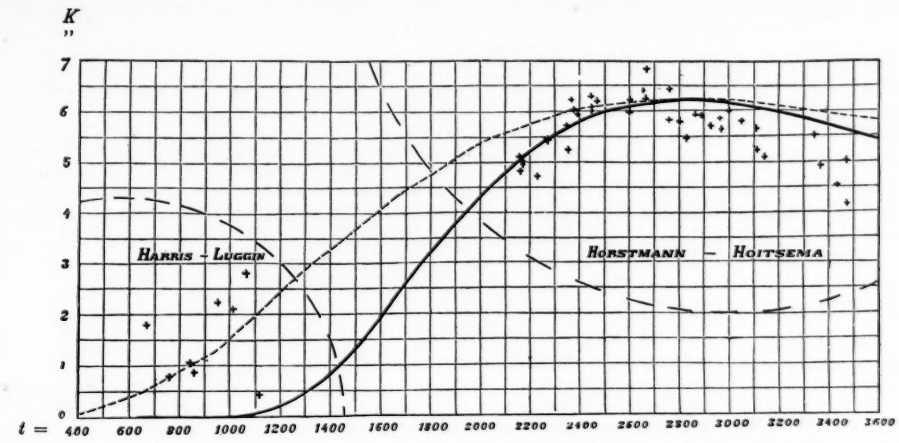
$$q = 10111 - 0{\cdot}72\,t - 0{\cdot}00101\,t^2 \quad (38),$$

in which t is expressed in degrees Centigrade, calculated from the melting point of ice as zero; while in formula (37) T refers to absolute temperature—that is, with the zero 273°C. below the melting point of ice. Thus $t = T - 273°$. Filling in the value of q, and integrating the value thus obtained, we have from (37):

$$\log.\,\text{nat.}\,K = -\frac{5116}{T} - 0{\cdot}1941\log T - 0{\cdot}000505\,T + C. \quad (39).$$

C is a constant, which can be calculated if K is known for a certain temperature. Hoitsema's results give for K as maximum about 6·25 with a temperature of 2670°C. Theory, however, requires, by placing q = 0, this maximum to occur at 2825°C. As the temperatures can only be determined approximately, the agreement may be regarded as satisfactory. Assuming that the maximum K = 6·25 does occur at 2825°C., and filling in this value in formula (39), it is found that C = 5·7261.

Now K can be calculated for all temperatures; and combining the values thus formed, the dotted line shown in the diagram is obtained. This line will pass through the absolute zero—that is to say, K = 0 for T = 0—and after having passed through the maximum K = 6·25, K again approaches zero, but never reaches it. Theoretically, therefore, K has at t = 950° C., already a very great value; while Naumann's experiments for this temperature point to a value K = 0. Luggin takes no account of Naumann's experiments, and is of opinion that the values found theoretically for K, even with a very low temperature (1000° and under), correspond to actuality. From Harris's experiments, already



referred to, he calculates the values of K at temperatures between 600° C. and 1200° C., and sees an agreement between theory and the results of the experiments. The agreement is not apparent; but to enable the reader to judge for himself the observed points are shown by crosses in the diagram.

Luggin's opinion is clearly untenable, for, according to the theory advanced, K should be about 1·4 at 950° C. But Naumann tried at this temperature to obtain a reaction between 1 part of CO_2 and 3 parts of H_2. So that, if x represent the part, there would be converted into CO and H_2O:

$$1{\cdot}4 = \frac{x^2}{(1-x)(3-x)} \ldots (40);$$

or in this case evidently just as many molecules of H_2O as of CO must be formed. From equation (40), the value $x = 0{\cdot}8$ is found; and hence the following composition:

0·8	or in percentages	20 CO
0·8	,,	20 H_2O
0 2	,,	5 CO_2
2·2	,,	55 H_2

And assuming even that the H_2O, on account of condensation, has escaped observation, the percentage composition would be:

25·00 per cent.	CO	0 per cent.	CO
6·25 ,,	CO_2	while it originally was 25 ,,	CO_2
68·75 ,,	H_2	75 ,,	H_2

It cannot be assumed that so clever an experimentalist as Naumann would not have noticed the enormous difference, and that in a mixture which theoretically should contain 25 per cent. of CO, he could have been unable to find any trace of CO. Not only Naumann's experiments make the supposition impossible, but, assuming that there was really equilibrium, Harris's experiments agree badly with the calculated values of K; and even the Horstmann-Hoitsema results deviate appreciably from the dotted line. With slight differences, due to the maximum being taken at a different temperature than the experiments gave, the observed values for K are smaller right and left of the maximum than would be calculated from theory. There must be a reason for this difference, though so far no one has given it. If the formula is altered so that the observed values more nearly agree with it, it necessarily becomes empirical. But from such a formula the value of K at other temperatures can be predicted with more or less probability. The formula when thus adapted, on the assumption that the curve traverses a point representing the average of observations about 2200 C., becomes:—

$$\text{I.K.} = -\frac{5116}{a\,T' + 3098} - 0{\cdot}1941 \log.(a\,T' + 3098) - 0{\cdot}000505\,(a\,T' + 3098) + 5{\cdot}7261 \ldots\ldots (41),$$

in which $T' = t - 2825$ and $a = 1{\cdot}4122$.

With the help of the values of k calculated according to this formula, the curved line in the diagram has been constructed. Therefore K no longer passes through the absolute zero, but is at zero at 631°C. This agrees exactly with the observed fact that below 600°C. there is absolutely no interaction between the gases in question. Further, at 950°C., K is still so small, that it is not surprising that Naumann, after a short heating to this temperature, could find no CO in a mixture of CO_2 and H_2. The values of K calculated from Harris's experiments, still further deviate from the line, because so far as the proportion of H_2O was concerned, no equilibrium had been established. Only the last experiment at 1125°C. nearly attains equilibrium; and it may be remarked that Luggin's theory would here be quite untenable.

After this discussion of theory, there is still the "run" to be considered. This can, however, be done briefly. The teachings of experience and theory, as well as the means dictated by theory for securing high efficiency in the "run," will be treated together in a single section.

(To be continued.)

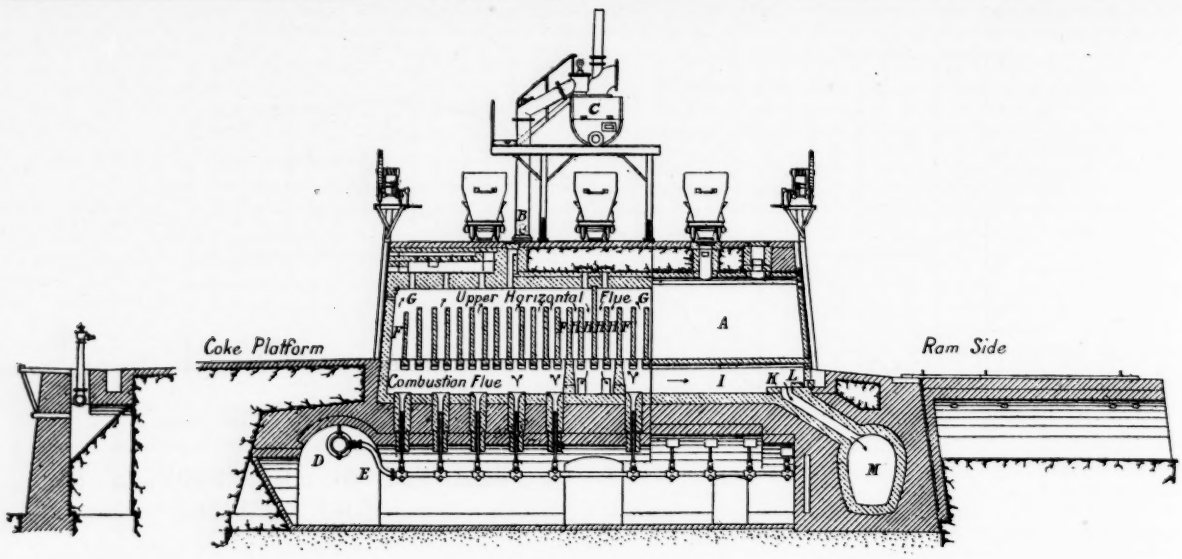
According to a telegram sent last Sunday from New York to the "Daily Express," the consumers of coal are preparing to import this fuel from Wales, owing to the dearth caused by the strike. This will be rather a turning of the tables. Anthracite coal is 50s., and bituminous 27s., a ton.

RECOVERY OF BYE-PRODUCTS IN COKE MAKING.

In the "JOURNAL" for the 13th ult. (p. 1289) a short notice appeared of a paper on the above subject read by Mr. J. THIRY at the recent annual meeting of the Iron and Steel Institute. We have since received from the Secretary of the Institute (Mr. Bennett H. Brough) a print of the paper, which is of sufficient interest to our readers to justify reproduction in our columns.

The importance in modern times of economizing in every branch of industry connected with the production of iron and steel has of late years led many inventors to bestow great attention on the manufacture of coke, and to endeavour by every available means to reduce the cost of production—profiting at the same time, wherever possible, by turning to account the valuable bye-products carried off in the volatile constituents of the coal during the process of distillation. In this country, too, where the use of coke from the beehive oven still continues much in favour, increasing interest has lately been manifested in the new methods of coke production, and a number of plants have been erected which embody many of the most recent improvements. Nevertheless there still exists, in the minds of many, an invincible prejudice against the use of retort-oven coke in the blast-furnace; and the adoption of the retort-oven, whether with or without means for the recovery of bye-products, proceeds but slowly, on account of the strong preference of so many iron-masters for the coke produced in beehive ovens. Much credit is therefore due to Evence Coppée, to the late Henry Simon, and to J. Darby, the pioneers of the modern system in England, that they have succeeded, in spite of much opposition, in establishing in this country, the former some 2000 ordinary retort-ovens, and the two latter together about 1400 bye-products ovens. Another firm—that of Dr. C. Otto and Co.—have hitherto chiefly confined their practice to Germany, where no fewer than 14,000 ovens have been constructed on their system, besides which some 2200 have been erected in the United States, in accordance with their patents. It is only recently that they have attempted to introduce their system into this and other countries. A battery of 50 of these ovens has been in successful operation for about four years at the Newport Iron-Works of Sir B. Samuelson and Co., of Middlesbrough, and an additional battery of 80 was built during last year at the same works, and is expected to be at work within the next month. Altogether, some 200 examples of the Otto-Hilgenstock bye-products oven will shortly be in operation in this country; and the construction of others in South Wales and Yorkshire is about to be proceeded with.

Through the inventions of the late Dr. C. Otto, and the subsequent improvements of Mr. G. Hilgenstock, the Otto-Hilgenstock oven has been so far perfected that by its means a coke is produced which, both as regards quality and yield, is unsurpassed. The standard oven is 33 ft. 7 in. long, 6 ft. 6 in. to 6 ft. 8 in. high, and 1 ft. 9 in. wide in the middle. But, notwithstanding its small capacity, the average output of such an oven is 31 to 32 tons of metallurgical coke per week. The general features of its construction are probably well known to most; but the drawing on the next page will render the description more clear. The gases given off from the coal in the oven chamber A pass through the opening B into the gas-main C on the top of the ovens, whence they are drawn into the gas-coolers and other vessels by means of exhaust fans. After being freed from the bye-products, they are returned ready for use in heating up the flues of the ovens through the main-pipe D, which supplies all the battery. From this main a number of smaller pipes E branch out into the arches which support the ovens, and from these again are led lateral branches which rise up to nozzles inserted in the heating-flues F, which convey the necessary gas to each wall of the chambers. Bunsen burners are fitted to the nozzles, and by their action draw in for combustion sufficient air, which has previously become heated on its way through the arches to the flues. Thus in the simplest manner possible, and without providing any special apparatus



THE OTTO-HILGENSTOCK COKE-OVEN.

for the purpose, the air for combustion is heated to a temperature of 400° C. only by utilizing the heat from the foundations—an arrangement which confers the additional advantage of preventing these from becoming over-heated. The gas and air ignite on meeting, and the flame rises vertically into the horizontal bottom flue, and ascends through the vertical heating flues F to the horizontal top flue G. The direction of the flame throughout is the natural one, upwards; and there are no bends or angles to impede its course, necessitating a pressure or artificial draught. From the horizontal top flue, the gases are led off into the centre through the vertical flues H under the bottom I of the oven; this interception of the gases and their conduction below being necessary if their full heat is to be utilized. The products of combustion then pass from the bottom of the oven through the opening K, which is controlled by the damper L, to the main waste gas-collector M, thence to the boilers, and are finally drawn off through the chimney. It will be seen that by this arrangement the Siemens regenerators for heating the air for combustion, which formed the distinctive characteristic of the Otto-Hoffmann bye-products oven, are entirely dispensed with.

Comparing the working of the old method with the new, there was, on the one hand, the low value of the waste heat for the generation of steam and the intermittent supply of heat to the oven due to heating the sides of the chamber alternately, which involved the necessity of providing two main waste-gas flues and very long gas passages. On the other hand, in the new system there was obtainable an increased yield in coke and bye-products, without special provision for preheating the air for combustion. It was mainly these considerations which induced the Otto Company to abandon altogether the Otto-Hoffmann in favour of the Otto-Hilgenstock oven, though the former had for more than twelve years (from 1882 to 1894) been regarded in Germany as the leading type for the recovery of bye-products.

The chief improvements consist, first in the use of Bunsen burners. By this means perfect combustion of the gases is obtained, and the even distribution of the burners along the whole length of the oven ensures a uniform heat in all parts. At the same time a very high temperature is attained, upon which circumstance the quality of the coke so noticeably depends. Secondly, the heating gases have only a very short distance to travel, and this in the upward and natural direction. Therefore the draught required is very little, and, as an oven wall is never gas proof, the losses arising from the leakage of gas from the oven chamber to the flues, or *vice versâ*, are reduced to a minimum. Further, if, as sometimes occurs, the gas pressure weakens from any cause, the flow from the flues is apt to become irregular or to stagnate entirely in those farthest removed from the point of admission. This defect is especially troublesome in ovens with horizontal flues, and leads to the irregular heating of the coke chamber, which in turn causes a deterioration in the quality of the coke, and increases the time of coking. The arrangement, however, of conveying the heating gas from the lower to the upper horizontal flue through short vertical flues, permits the most complete supervision and control of the flow of gas in every part of the flues. Owing also to the high temperature, the coking time is shortened, and therefore an increased production per oven per week is obtained, and the cost of labour is, of course, correspondingly reduced.

Analyses show that the gases generated in these ovens are very pure, and contain not more than 5 per cent. of nitrogen; whereas in other ovens, where a stronger draught is required, the proportion of nitrogen rises to 10 or 12 per cent. The value of the gas, both as an illuminant and as a heating agent, is therefore enhanced, and experiments also show that the resulting tar is richer in valuable bye-products. Consequently the output of benzol and its kindred compounds is increased.

By paying the most careful attention to the working out of the details of the design, the efficiency of the oven has been increased until the yield in coke is some 5 per cent. more than the crucible yield—a circumstance which is principally due to the small chimney-draught required for working the ovens.

The author regrets that he is unable to furnish data regarding the cost of production in England, as he has hitherto had no opportunity personally of working an installation in this country; but from all information which he has been able to gather from ironmasters who own these ovens, he is in a position to assert that the cost of labour is no higher than that for working the beehive ovens. With the exercise of due care in the management of a plant, the repairs are insignificant, and the life of an oven may be safely put at from ten to twelve years before any heavy repairs are needed. There are many instances in Germany of batteries which have been working uninterruptedly since 1896, the only repairs necessary having been occasioned by carelessness in quenching the coke, by which the hot brickwork was damaged. An increase in stability and durability is imparted to the structure by reducing the height. This is about 6 feet; but larger ovens have been built in this country, though at a sacrifice of the full period of the oven's life.

By the kindness of Sir B. Samuelson and Co., the author has, however, been permitted to carry out some tests with regard to temperature, draught, and duration of the coking process, of which the following is a summary of the results:—

(*a*) *Combustion Flue.*—Measurements taken at different ovens gave a temperature of 1378° C. (2510° Fahr.), 1389° C. (2534° Fahr.), 1408° C., 1396° (2220° Fahr.) C., and 1462° C. (2664° Fahr.) respectively. The pressure of the draught below that of the atmosphere was equivalent to a water pressure of 1·52, 1·89, 2·39, 1·96, and 1·16 mm. respectively.

(*b*) *Lower Horizontal Flue.*—The temperatures were 1227° C. (2243° Fahr.), 1254° C. (2285° Fahr.), 1312° C. (2395° Fahr.), and 1215° C. (2200° Fahr.), and the pressure of the draught was equivalent to a water pressure of 1·79, 1·53, and 2·10 mm. below the atmospheric pressure.

(*c*) *Upper Horizontal Flue.*—The temperatures measured at different ovens were: 1166° C. (2136° Fahr.), 1142° C. (2085° Fahr.), 1250° C. (2282° Fahr.), 1145° C. (2092° Fahr.), 1190° C. (2174° Fahr.), 1184° C. (2160° Fahr.), 1278° C. (2335° Fahr.), and 1144° C. (2090° Fahr.). The pressure of the draught measured at different ovens was equivalent to a water pressure of 0·44, 0·66, 0·51, 1·02, 0·29, and 1·52 mm. below the atmospheric pressure.

(*d*) *Gas-Main.*—At the top of the oven and at the point of entry into the exhaust-pipe the pressure was equal to a water pressure of 0·44 mm. below atmospheric pressure; and the temperature in the main was 283° to 293° C. (544° to 560° Fahr.).

(*e*) *Waste-Gas Flue.*—In front of the ovens the pressure was equal to a water pressure of 6·89 mm., which increased to 10·30 mm. before entering the boilers; the temperature being 1245° C. (2273° Fahr.).

(*f*) *Air for Combustion.*—The temperature at the top of the gas-burners varied between 355° C. (671° Fahr.) and 438° C. (820° Fahr.). The slight differences in the temperature and draught were due to the lack of proper regulation by the oven damper L.

Looking back to the performances of the earliest types of bye-products ovens, and by referring to the numerous communications made to the Institute in 1883, 1884, and 1885 concerning these, some idea will be gained of the immense progress made since those days. The production of coke in 1883 was about 1·2 to 1·5

tons per 24 hours per oven; while with the present oven of the Otto-Hilgenstock type it amounts to 4·5 tons per oven in the same time—the capacity of the oven being practically just the same. For this remarkably increased efficiency the improved method of firing is chiefly responsible, since the rapid production of coke depends on the supply of heat available.

Soon after the introduction of bye-product coke, complaints as to its quality became very numerous; but when regard is had to the great improvements in coke-oven construction since those days, it appears to the author that the prejudice against retort-oven coke is no longer reasonable, especially as in all other iron-making countries—the United States, Germany, France, and Belgium—the modern methods of producing coke have long since been universally adopted. It has, moreover, been substantiated by numerous tests with the coke made in the Otto-Hilgenstock ovens at Middlesbrough that the loss on ignition in the crucible test is only 0·5 to 0·6 per cent.—that is to say, it is quite equal to coke made in the beehive oven. It is also a noteworthy fact that since the introduction of the principle of heating from the bottom by Mr. Hilgenstock, by which the gas passages are so conveniently shortened, all other constructors of coke-ovens have endeavoured, as far as possible, to imitate him by adopting the same principle. When all the various advantages of the modern system of ovens are fairly considered, and taking into account besides that the yield of such an oven is 15 to 20 per cent. higher than with the beehive oven, it must be apparent that there is some justification for incurring the greater expense required for the establishment of a bye-product plant, especially as the demand for the products themselves is very considerable, and continues to be so in spite of the greatly increased production of the chief constituent—the sulphate of ammonia. It has indeed, of late, been urged as an objection to the adoption of bye-products coke-ovens that, if such plants continued to be built in increasing numbers, the production of sulphate of ammonia would correspondingly increase until the supply far exceeded the demand; thus rendering it difficult to find a market for the excess product. A general fall in price might then be anticipated, which would cut down any margin of profit, and makers of coke would find themselves with expensive plant left on their hands which could only be worked at a loss.

With the object of ascertaining to what extent such apprehensions were justified, and being desirous of placing the true facts before the ironmakers, the writer caused inquiries to be made, and eventually elicited from the German Association for the sale of sulphate of ammonia an expression of opinion as to the future prospects of the industry, which may be regarded as quite trustworthy. According to this authority, the best evidence of the maintenance of prices in the future is afforded by a study of the published returns relating to the manufacture of sulphate of ammonia since 1895, and a comparison of the fluctuations in price corresponding to the state of the market for the same period. In the light of these facts, it will, no doubt, be possible to refute—and, in fact, to dispel entirely—the groundless apprehensions entertained by those who are interested in this question. In Westphalia the production of sulphate of ammonia in 1895 was 10,043 tons, and it rose in the following year to 21,377 tons, with an average price of £7 18s. per ton. In 1897 the production was 32,418 tons, of the value of £7 13s. per ton. Throughout the succeeding years it continued to increase until, in 1900, it amounted to 49,223 tons; the price also gradually advancing until it reached £10 6s. per ton. Prior to the year 1895, the individual manufacturers sold their product independently, which renders it difficult to estimate the average value before that date. It may, however, be assumed that it fluctuated between £9 16s. and £10 6s.

The total production in the year 1898 was estimated at 440,000 tons. In 1901 the world's production is estimated as amounting to 523,000 tons; Great Britain figuring for 220,000 tons, Germany for 130,000 tons, France and Belgium for 73,000 tons, Austria, &c., for 40,000 tons, and the United States for 60,000 tons.

On comparing the selling price of sulphate of ammonia for the years above mentioned with the quotations for Chili nitrates, it will be found that the former follows to a certain extent those of the latter; but the difference in the nitrogen content of each—21·2 per cent. for sulphate of ammonia and 16·4 per cent. for Chili nitrates—must be taken into account. When it is further considered that about 1,300,000 tons of Chili nitrates are yearly produced and used, and moreover that sulphate of ammonia is a particularly suitable substitute for Chili nitrates as a fertilizer, for which purpose the latter is principally employed, it is abundantly clear that only when the price of Chili nitrates is depressed will it be possible for a continuous backward tendency in the price of sulphate of ammonia to occur. The prices of Chili nitrates, have, however, as a matter of fact, materially increased of late; and even if they decline, they can only fall in the most extreme case to a level of £7 per ton, below which figure the production and preparation of nitrates would cease to be profitable. This would, however, be equivalent to a price of £9 5s. per ton for sulphate of ammonia, on taking into account the superior nitrogen content of the latter. Further, it is possible that the nitrate fields will, according to the present available estimates, be completely exhausted in 23 years, provided the yearly production continues at the same level as in recent years—viz., 1,300,000 to 1,400,000 tons. Probably, therefore, the great need for nitrogen as a fertilizer will no longer be sufficiently met (as at present) by the use of nitrates, and it will be imperative to increase very largely the production of nitrogen—that is to say, ammonia—for the purpose of satisfying the demand. At the present time, in Germany, nearly 160,000 tons of sulphate of ammonia are used annually for agricultural purposes. In addition to this, the imports of nitrates in 1900 amounted to 484,543 tons, and in 1901 to 529,568 tons, which in regard to nitrogen are equivalent to 363,300 and 397,200 tons of sulphate of ammonia respectively.

In order to ascertain the suitability of coals from various districts for treatment in bye-products coke-ovens, a number of analyses of coals from different British coalfields have been made; and the results are given in an appendix. It is to be hoped that these figures will suffice to remove all doubts concerning bye-products ovens as a future source of profit and economy; and that the most sceptical opponents of the system will be convinced that their apprehensions with regard to large modern installations, with recovery plants attached, are groundless.

APPENDIX.

[The figures are in all cases percentages.]

Coalfield.	Yield of Coke.		Gas from 1 Ton of Dry Coal at 15° C. in Cubic Metres.	Volatile Matter.	Ammonia.	Ammoniacal Liquor.	Sulphate of Ammonia.	Tar.	Carbonic Anhydride (CO_2).	Sulphuretted Hydrogen (H_2S).	Benzol.	Ash.	Moisture.
	By Crucible Test.	In Otto Bye-Products Oven.											
Derbyshire	65·27	71·67	277·3	28·33	0·434	8·62	1·685	2·85	3·99	0·69	0·63	16·05	0·75
,,	70 28	75 48	274 6	24·52	0·397	7·36	1·540	2·45	3·54	0·11	0·91	12·27	0·40
Durham	68·36	75·21	324·7	24·79	0·319	4·69	1·240	3·56	1·00	0·44	1·42	8·22	0·44
,,	67·25	75 06	324·6	24·94	0·357	4·90	1·385	4·39	1·51	0·51	1·43	4·54	0·13
,,	67·84	76 05	302·1	23·95	0·373	5·39	1·448	3·01	1·66	0·20	1·44	2·78	0·13
,,	69·13	75·25	307·9	24·75	0·353	5·43	1·373	4·45	1·12	0·37	1·30	5·45	0·15
,,	71·45	77·43	306·5	22·57	0·350	4·39	1·360	4·13	0·92	0·33	1·33	6·58	0·10
Glamorgan	77·95	83·61	279·8	16 39	0·287	2·60	1·114	2·17	0·68	0·09	1·04	1·87	0·27
,,	74·05	80·13	288·5	19·87	0·326	4·78	1·268	2·40	0·99	0·17	1·43	1·62	0·40
,,	81·72	85·00	264·5	15·00	0·298	3·44	1·157	2·40	0·47	0·20	0·88	12·22	0·28
,,	74·90	80·75	305·4	19·25	0·286	3·91	1·113	3·13	0·80	0·08	1·18	2·14	0·30
,,	77·95	82·76	281·0	17·24	0·294	3·93	1·144	2·39	1·17	0·22	0·93	13·07	0·47
Lancashire (W.)	60·95	70·40	352·0	29·60	0·513	8·02	1·993	3·16	2·87	0·50	1·57	5·86	0·21
,, ,,	63·57	71·90	323·0	28·10	0·466	5·98	1·808	2·70	3·36	0·39	1·35	8·60	0·40
Monmouthshire	81·97	85·84	253·0	14·16	0·278	2·91	1·078	1·75	0·63	0·12	0·67	5·96	0·39
,,	80·91	84·92	..	15·08	0·288	3·30	1·043	1·76	0·76	0·21	0·85	5·50	0·63
,,	75·52	80·18	305·7	19·82	0·260	5·67	1·008	2·68	1·07	0·17	0·91	7·43	0·07
,,	75·57	80·83	295·9	19·17	0·247	5·97	0·960	2·97	0·86	0·17	0·97	7·55	0·09
,,	75·10	80·97	300·6	19 03	0·297	6·17	1·153	2·75	0·99	0·17	0·85	8·50	0·15
,,	70 90	77·73	270·0	22·23	0·300	5·12	1·166	2·92	2·21	0 23	1·08	20·23	0·14
,,	72·00	78·26	280·3	21·74	0·294	5·85	1·144	2·25	2·11	0·19	1·17	20·28	0·20
Somersetshire	72·80	79·92	307·3	20·08	0·343	4·58	1·334	2·31	1·21	0·16	1·01	5·05	0·35
Stirlingshire	63·69	71·18	323·9	28·82	0·443	9·11	1·720	3·62	2·25	0·36	1·32	7·45	0·82
Warwickshire	58·08	65·96	288·7	34·04	0·456	12·75	1·813	2·99	4·31	0·26	1·13	6·62	2·38
Yorkshire	63·72	69·71	306·3	30·29	0·355	11·82	1·375	3·35	2·19	0·24	2·32	6·52	4·69
,,	67·95	75 21	300·6	24·79	0·383	5·73	1·483	3·73	2·05	0·44	1·57	11·47	0·59
,,	65·80	73·08	320·6	26·92	0·414	6·57	1·572	3·71	2·75	0·15	1·60	6·77	0·90
,,	68·97	75·17	281·3	24·83	0·372	6·63	1·444	3·49	1·62	0·51	1·22	19·34	0·31
,,	68·13	74·29	274·1	25·71	0·344	7·39	1·337	3·99	1·49	0·43	1·29	10·59	0·67
,,	64·98	73·70	317·7	26·30	0·380	5·98	1·478	4·49	1·21	0·53	1·50	7·79	0·28
,,	68·54	75·59	309·6	24·41	0·373	6·79	1·448	2·71	1·05	0·62	1·46	12·38	0·27

* Including CO_2, SH_2, C_6, H_6

THE NATURE OF THE HEAVY HYDROCARBONS IN ILLUMINATING GAS.

THE following is an abstract translation of an article on this subject by Dr. P. Fritzsche, of Leipzig, in a recent number of the "Journal für Gasbeleuchtung."

Attention has been repeatedly called of late to the changes which are being brought about in the gas industry by the increasing use of incandescent lighting. The heavy hydrocarbons which were formerly the determining factors for the value of illuminating gas, are losing their importance through the use of the Welsbach burner. With this, they have substantially only their value as heat-producing bodies; and the cost of their production ceases to be in proportion to their practical worth. It will now become matter for serious consideration whether it will not be better in a new gas-works to erect water-gas plant, which, in order to meet pre-existing obligations, will be provided with apparatus for producing carburetted gas. In the large towns of Germany, however, it will still be necessary, for some time to come, to make and use coal gas, because of the plant already erected. The necessity of continuing existing arrangements, and thus producing illuminating gas—even though heating gas only is required—will perhaps lead to other more profitable uses being sought in many places for the illuminating components of the gas.

For instance, these heavy hydrocarbons may be extracted from the gas. It would certainly be worth while to extract the benzol, at any rate, so long as the German production can be absorbed in meeting home requirements. Whether it would also be profitable in the case of other heavy hydrocarbons—*e.g.*, ethylene—can only be ascertained from exhaustive calculations. The question is certainly worth studying more closely. One way of utilizing ethylene industrially has long been known. The gas is washed with concentrated sulphuric acid, whereby ethyl-sulphuric acid is formed, which is either worked up direct into ether, or it can, by distillation with water, be converted into alcohol. The difficulties in carrying out this scheme arise less from the low rate of absorption (which can be increased by applying heat) than from the hydrocarbons which accompany the ethylene and are separated from the gas by the concentrated sulphuric acid, with the formation of condensation products. This difficulty can in the main be now looked upon as overcome.

Later researches—particularly the discovery of cyclopentadiene in the hydrocarbon of oil gas, and the determination of its constitution by Krämer and Spilker in 1896—have proved that, besides benzol, acetylene, and ethylene, and their homologues, there are also other gases and vapours in illuminating gas, the existence of which had previously been denied. It is admitted now, that illuminating gas may contain all possible compounds of carbon, hydrogen, oxygen, sulphur, and nitrogen, which in these climates generally remain in a state of gas or vapour. It depends on the special nature of the material carbonized, and the conditions of carbonization, how many of these decomposition products are present in the gas. Treating the gas with strong sulphuric acid serves as a starting point for ascertaining the total quantity of the hydrocarbons which accompany ethylene and benzene in the gas. In contact with this acid, they are either polymerized or are simply dissolved in the acid, or form sulpho-acids. The increase in weight of a system of washing vessels charged with strong sulphuric acid, as soon as a determined amount of dried gas has passed through them, serves to indicate the quantity of the hydrocarbons contained in the gas, which are neither benzene nor ethylene. The latter are only dissolved to a slight extent on passing through concentrated sulphuric acid. In this manner, 5 to 15 oz. increase in weight per 1000 cubic feet of gas is obtained. If the weight of 1 litre of the condensed gases be 2 grammes, the illuminating gas would contain 0·25 to 0·75 volume per cent. of such condensable hydrocarbons. From oil gas up to 100 oz. per 1000 cubic feet are obtained. The author recognized that it was not feasible to calculate the ethylene contained in a gas from the difference between the benzene and the total amount of heavy hydrocarbons, nor to determine the bromine absorption of a gas and to estimate therefrom the ethylene contained in it. He has not therefore pursued experiments in this direction, with a view to thus finding a method of determining ethylene, because the condensable gases would take up all the bromine.

Herr O. Pfeiffer has shown that benzene vapour, and indirectly the acetylene in the gas, can be determined by using the method worked out by Lunge and Harbeck, and improved by himself, provided that it is only a question of calculating the heating value of the gas. Haber has apparently not applied to illuminating gas the method which he and Oechelhaeuser worked out (see "JOURNAL," Vol. LXVIII., pp. 458, 501, and Vol. LXXV., p. 1439). This method is certainly very convenient for pure mixtures of benzene vapour and ethylene; but, unfortunately, such mixtures seldom occur. The author has essayed the utilization of the ethylene contained in coal and oil gas, and in connection therewith he required an exact method of determining the ethylene. He found this in the alcohol method which he has used in the examination of coal gas, coke-oven gas and oil gas, with results which are at least very probable. When more is known about the gases associated with ethylene in coal gas and oil gas, it will be possible to make artificial mixtures of ethylene with the gases in question, in order to find out whether the latter affect the reaction of sulphuric acid on the ethylene. For the present, the fact must suffice that, for example in the case of coke-oven gases almost free from benzol, the proportion of ethylene was found to be from 0·3 to 0·6 volume per cent. less than the total proportion of heavy hydrocarbons. The difference is accounted for by the hydrocarbons, which form condensation products in contact with concentrated sulphuric acid. With these must also be reckoned the higher homologues of ethylene—from butylene onwards, as they are readily disposed to polymerize, and some of them are converted into alkyl-sulphuric acids only with somewhat dilute sulphuric acid.

This also explains why the alcohol produced by absorption of the ethylene from coal or oil gas contains only very small quantities of alcohols having a boiling-point above that of ethyl-alcohol. Even propyl or isopropyl-alcohol cannot be contained in noticeable quantities in the gas alcohol, as it would be shown by the boiling-point of the ether produced from such alcohol. This ether, however, has a normal boiling-point. On closer consideration, it is evident that the probability of a reaction between the ethyl-sulphuric acid arising from ethylene, and the condensation products is very small. To obtain a thorough shaking out of the hydrocarbons from the gas, a great excess of acid must be used. The concentration of the resultant compounds is thus much reduced.

The alcohol method takes a lot of time, and demands great patience on the part of the experimentalist—at least with present appliances. It would be simplified if a small column apparatus could be constructed, which would admit of the acid containing the alcohol being distilled off in a single operation. The shaking out of the ethylene can very easily be performed by mechanical contrivances.

An alteration of the Haber-Oechelhaeuser method—consisting of washing the crude gas with concentrated sulphuric acid, and afterwards titrating with bromine water—would scarcely be successful, because there are bodies in gas which only condense after long shaking with concentrated sulphuric acid, and probably unite also with bromine.

The author, having applied the alcohol method to carburetted water gas and to oil gas, gives some of his results. The acid was not heated, and the agitation with cold pure concentrated sulphuric acid was carried out in calibrated flasks of 2 to 4 litres' capacity. Agitation for two hours with 100 to 150 c.c. of concentrated acid is sufficient if the flask is vigorously shaken. A large separating funnel can be used for the agitation, such as Herr Pfeiffer has used for determining the benzene.

In samples of carburetted water gas were found:—

	I.	II.	III.	
Heavy hydrocarbons	9·4	8·6	10·2	per cent.
Ethylene	5·6	4·8	5·2	" "

In oil gas from a gas-works at Brooklyn:—

	I.	II.	III.	IV.	
Total heavy hydrocarbons	48 6	47·5	49·8	48·2	per cent.
Ethylene	19·4	18·6	20·4	17·1	" "

The latter samples were taken direct from the retorts, and the gas was filtered through cotton wool. Examination was made as soon as the samples had cooled sufficiently. After the condensers and scrubbers even, the gas always contained 40 to 42 per cent. of heavy hydrocarbons (illuminants). Average samples could not be taken, as there was no special gasholder for the oil gas, which served for carburetting water gas. It was at once mixed with the water gas. Herr F. Fischer, in his German "Handbook of Chemical Technology," gives some analyses of carburetted water gas in which ethylene and propylene are separately stated. It is not clear how they were separated.

The condensation products resulting from the treatment of coal gas or oil gas with sulphuric acid certainly contain many other interesting bodies. If the gas is first washed with dilute, and afterwards with concentrated acid, some hitherto unauthenticated constituents may be expected to be revealed. Terpenes are most probably among the products of condensation. A class of compounds, soluble in concentrated sulphuric acid, but thrown out on dilution, producing a milkiness, and subsequently collecting on the surface, when they dissolve with a green colour in pure water, are perhaps identical with the sulphur acids the author has already described in the "Journal für praktische Chemie." (See Vol. LVI., p. 258.)

The *conversazione* of the Institution of Civil Engineers, last Wednesday and Thursday, was a great success. The guests, who attended in large numbers, were received each evening by Mr. Charles Hawksley (the President) and Mrs. Hawksley. As usual, there was a capital display of engineering models and scientific apparatus. In one room Mr. George Beilby showed the film structure on the surfaces of polished metals, which, as already mentioned, he had on view at the recent *conversazione* of the Royal Society. By means of the light of a 3000-candle arc lamp, the image of a surface of frosted silver magnified to 1000 diameters was projected on a screen. It showed the silver to be covered with gauze-like films of metals, so thin that their reflections were no longer metallic. Slight pressure with any hard surface appears to wield these films together into a continuous film, which reflects and absorbs light like the metal in its massive form.

THE COEFFICIENT OF EXPANSION OF CONCRETE.

The "Engineering Record" has published an abstract of a paper, written by Professor W. D. Pence. The author remarks that, with the increasing use of concrete as a structural material, the demand for a definite knowledge of its physical characteristics becomes more and more urgent. Unfortunately, concrete varies radically in quality according to its composition and preparation, and, of course, what should be its constants suffer like fluctuation. There is one constant, however—the co-efficient of expansion—which probably varies but slightly. The object of the paper is to elucidate this point; for which purposes experiments were made at the School of Engineering, Purdue University, upon a make of concrete representing the best practice in the combined concrete-steel type of arch work. The proportions of the mixture were 1 : 2 : 4; and the scheme of the experiments comprised the heating of a bar of concrete of known length through a determined range of temperature, and the measurement of its alteration of length in the circumstances. Simple as was the programme, it took much time and trouble to carry out. The heating was done by a steam jacket. The concrete bars were cylinders 36 in. long and 4 inches diameter. The final results showed that for gravel concrete, the co-efficient of linear expansion is 0·00000054 per degree Fahr.; and for limestone concrete, 0·00000055 per degree Fahr. This value is conveniently remembered as being "five zeros fifty-five." Professor Pence remarks that the usual assumption of equality and expansion of steel and concrete is erroneous by 15 per cent. Still this discrepancy is not likely to be of very serious moment in working. The practice is growing in America of mixing concrete very wet; so that, after ramming, a person walking on it would sink in up to the ankles. This concrete sets in the course of 36 hours hard enough to bear the running of wheelbarrows upon it.

GASIFICATION OF DUST-BIN REFUSE.

Dr. Bujard described a short time ago, at a meeting of German chemists in Würtemberg, some experiments on the gasification of dust-bin and other town refuse. The following are the principal particulars given by him.

House and street sweepings collected from Stuttgart in October, and having the following average composition (column 1 *infra*), were first consumed in a refuse furnace. Each of the two chambers of the destructor disposed of 8 tons per 24 hours. The exit gases in the space above the grate had a temperature of 750° Fahr.; and in the general flue for the two chambers, 660° Fahr. The grate of each chamber was supplied with air at a maximum pressure under the grate of 8-10ths., at the rate of 23 cubic feet per second. The residues obtained amounted to 48 per cent. by weight, or 37 per cent. by volume, of the dust consumed. They contained 1·92 per cent. of phosphoric acid, and 0·074 per cent. of potash. Trials were then made of gasifying sweepings, having the following composition (column 2 *infra*), in experimental gas-works plant; 1 cwt. of sweepings was worked off in each retort in four hours, and yielded 62·8 per cent. of residue:—

Composition of Sweepings	1. as Consumed in Destructor. Per Cent.	2. as Gasified. Per Cent.
Moisture	15 9	—
Coal and coke	10·7	4·0
Ashes and half-burnt coal	6·0	—
Glass, stoneware, metal, &c.	8·6	22·5
Straw, skin, bones, &c.	5·5	10·7
Paper, rags, wood	0·5	3 8
Coarse siftings	30 0	57·6
Fine siftings	22·0	

Trials were also made of gasifying other types of town refuse. The results of the trials were as follows:—

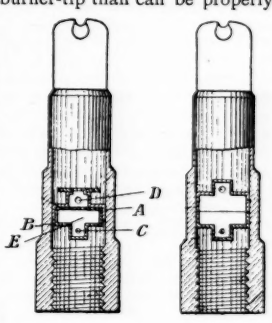
—	Street and House Sweepings.	House Sweepings (Dust) Only.	Briquettes from Residues of Sewage Purification.	Dried Excreta.
Yield of gas per ton, cubic feet	3750	755	11,700	11,000
Percentage of solid residue	62·8	68·8	54·0	37·3
Composition of gas, volumes per cent.:—				
Carbonic acid	19·6	20·8	22·0	11·2
Heavy hydrocarbons	1·4	3·4	3·2	6·4
Carbonic oxide	34·8	20·2	14·7	23·9
Marsh gas	6·2	8·9	11·6	13·6
Hydrogen	36·1	34·8	40·8	39·3
Nitrogen	1·9	11·0	7·7	5·6
Available calorific power, calories per cubic foot	81½	80	77	109
Illuminating power when burnt at the rate of 5·3 cubic feet per hour, candles	..	..	0·8—0·9	4·6

These trials were made in connection with preliminary work for the installation of sewage filtration plant. Others are now being conducted.

REGISTER OF PATENTS.

Gas-Burner Governor.—Bayles, A. G., of New York. No. 13,439; July 2, 1901.

This invention has for its object "to prevent more gas reaching the burner-tip than can be properly consumed;" a further object being "to provide for a uniform flow of gas through the tip, no difference what the pressure in the mains."



Two types of the apparatus are shown.

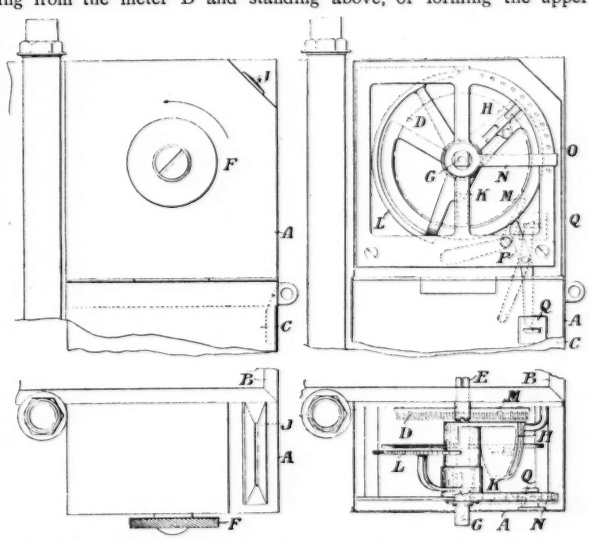
The check proposed in the pillar of the burner comprises a thimble-shaped, stepped piece A, held by frictional contact between the outer wall of the base and the interior wall of the pillar; an inverted thimble-shaped piece B, the base of which is held telescopically by frictional contact; a gauze screen between them; and a distributing plate above. The piece B is provided with one or more ingress-apertures, and the piece A is provided similarly with discharge-apertures D, either greater in size or more numerous, so that the discharge capacity of the latter apertures is greater than the receiving capacity of the former ones. In operation, gas flows from the bottom of the pillar into the chamber E through the apertures, and passes thence into the upper part of the pillar. As the discharge capacity of the apertures is greater than the receiving capacity of the apertures C, the pressure of the gas within the chamber is reduced; and as the chamber formed in the pillar above the check is larger than the chamber E, the pressure will be still further reduced within this chamber, especially if the aperture in the burner-tip should have a greater capacity than the aggregate capacity of the apertures D.

Coin-Freed Gas-Meters.—Wright, J. F., and Sutherland, A. G., of Birmingham. No. 13,680; July 5, 1901.

The object of this invention is to simplify the coin-operating mechanism of gas-meters, and "to provide for the more ready and convenient adjustment of the same to correspond with variations in the selling price of the gas."

The illustrations are: A front elevation and plan of the casing enclosing the coin operating-mechanism, with the finger-disc on the exterior; an elevation with the finger-disc removed, and the door of the casing thrown open; and a plan of the mechanism, with the casing in section.

The coin-operating mechanism is arranged in a casing A projecting from the meter B and standing above, or forming the upper



part of, the till-enclosure C. The main or coin-driven wheel D, which controls the delivery of the gas, is mounted freely on the central operating spindle E. A finger operating-disc F (or a like grip-piece) is fixed to the end of the spindle G, which projects in front of the casing, to allow the purchaser to operate the coin-carriage H.

The coin-carriage consists of a hollow arm secured to the spindle G and having an open side or end adjacent to the wheel D, so that the coin, on dropping from the slot J into the carriage H, directly engages with a pair of lateral teeth cut around the wheel. Thus, on turning the spindle G after the insertion of the coin, the wheel D is moved round with the carriage H, until the motion of both is arrested by a stop K, against which the coin-carriage abuts immediately the coin has passed clear of the arc or circular portion of the sector-like guard L. The coin then drops into the till.

Return movement of the wheel D is prevented by a pawl M, arranged to engage the teeth through which the wheel is driven by the medium of the coin. While the carriage and wheel are connected by the coin, the return of both parts is prevented; but when the coin falls from the carriage, the latter can be turned back with its spindle in readiness for a further movement of the wheel on the insertion of another coin. The pawl is kept in engagement by a counter-weight arm or projection, as shown.

For regulating the movement of the wheel D to correspond with the

selling price of the gas, there is mounted freely upon the spindle G, and attached with the coin-guard or sector L (which is also mounted freely on G), a spring-like arm N to serve as the price-changer. At its upper or outer end, the arm is provided with a catch-projection to engage any one of a number of indents or perforations in the adjacent portion O of the framework of the mechanism. The indents are graduated to permit a certain predetermined movement of the driving-wheel before the discharge of the coin from the carriage; and the delivery of gas, in cubic feet or otherwise, represented by the respective indents, is indicated by graduations displayed on the upper or peripheral edge or face of the portion O of the framework. The stop K is fixed on one of the arms of the sector L; and it thus moves with the sector on the adjustment of the latter by means of the price-changer or spring-arm N.

The price-changer is protected by the casing; but to permit of access thereto by the seller, the front part of the casing of the mechanism is hinged and secured by a latch P, operated from within the till-casing C. This engages with a slotted catch-piece Q projecting from the inner side of the hinged front. Thus, when the seller unlocks and opens the till-casing, he can readily release and open the casing of the coin-operating mechanism. Adjustment can then be effected by moving the price-changer into engagement with the required indent; for as the sector or coin-guard moves with the changer, provision will be made for the earlier or later discharge of the coin from the carriage, to give a less or a greater movement of the driving-wheel to correspond with the altered selling price.

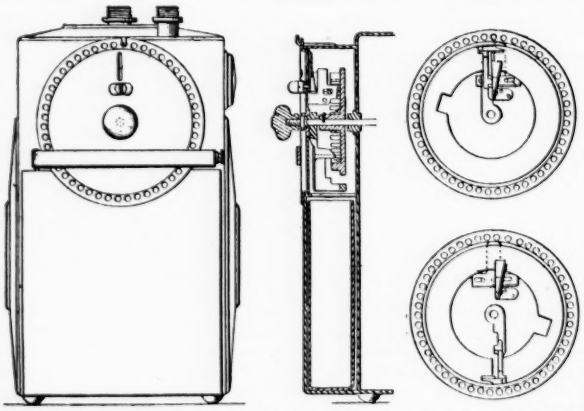
Coin-Freed Gas-Meters.—Gardner, R. C.; a communication from W. M'Donald and A. E. Wright, of Portland, Oregon, U.S.A. No. 19,081; Sept. 24, 1901.

This invention relates to slot-guards for coin-controlled gas-meters. It has for its object to provide an improved construction of mechanism operatively connected to a slide for closing the coin-slot, whereby, when the slide is moved to uncover the coin-slot, the vending apparatus will be automatically locked in position, and cannot be operated until the slide has been moved to cover the slot again. Other objects of the invention relate to details of construction. The invention is applied to coin-controlled apparatus for prepayment meters described in patent No. 25,272 of 1894.

Fig. 1 is an elevation of a meter provided with the improvements. Fig. 2 is a transverse vertical section. Fig. 3 is a rear elevation, showing the circular shield carrying the coin-carrier; the latter being adjacent to the stop. Fig. 4 is similar to fig. 3, but shows the coin-carrier turned to a position to allow the coin to fall therefrom.

The meter comprises a coin-controlled apparatus and a money-holder or till attached to the side of the meter; the till being arranged immediately below the coin-controlled casing. The main operating-spindle may be connected to any special device operated by the ordinary meter mechanism for stopping the supply of gas—for instance,

Fig.1. *Fig.2.* *Fig.3.*



such device as that described in patent No. 8327 of 1894. The main spindle projects from the meter-case into the coin-controlled casing, and is operated by a circular gear-plate mounted on the spindle and secured thereto; the gear-plate having a circular series of teeth or projections on the side facing the cover or price-changer, as in the first-named patent referred to above.

Between the gear-plate and the price-changer, and immediately behind the latter, is a circular shield, to which is secured a coin-carrier or pocket, into which a coin is passed through the slot of the price-changer, to rest in one of the notches between the teeth on the gear-plate, and so cause the gear-plate and coin-carrier to move together when the handle is turned. The handle is screwed upon an outwardly projecting stem of the coin-carrier. The shield serves to prevent the insertion of a coin through the coin-slot so long as the coin-carrier is out of coincidence with the coin-slot. The shield supporting the coin-carrier is loosely mounted upon the extremity of the spindle, so that, when no coin is inserted, the shield and coin-carrier can be turned without in any manner affecting the gear-plate. A stop is provided to limit the movement of the coin-carrier; so that the coin carried thereby may fall through an opening in the coin-controlled casing into the money-holder.

In order that the coin-carrier may be turned to have its pocket register accurately with the slot, the rear-face of the price-changer is provided with a stop, against which the coin-carrier will strike and be caused to register with the slot when it is desired to insert a coin. The stop has a base portion secured to the price-changer, and an upright portion or lug located a suitable distance inward from the rear face of the price-changer, so as to bring it in proximity to the teeth projecting from the gear-plate. Near the base of the lug is provided a transverse, elongated slot. Pivoted at its lower end to an inclined side of the lug, is a dog having a rectangular opening aligning with, but narrower or shorter than, the elongated slot. The dog is in the form of a flat metal plate of about the height of the lug, and having its rear or working edge sharpened or bevelled off so as to facilitate the entrance of the blade between the teeth of the gear-plate. As the slide-plate is moved to one side, to uncover the coin-slot, the dog will be forced outward by the operating arm, and its bevelled edge will pass into one or the other of the spaces between the teeth of the gear-plate and lock the plate against rotation so long as the coin-slot remains uncovered. Thus it will be impossible to fraudulently actuate the vending apparatus by inserting an implement through the coin-slot. Upon moving the slide-plate to cover the coin-slot, the dog will be withdrawn by the operating arm from engagement with the teeth of the gear-plate; and the plate may then be rotated through the medium of the handle, provided a coin has previously been inserted—the coin operating by passing between the teeth of the gear-plate to temporarily lock the coin-carrier and gear-plate together, as in the earlier patent. The slide-plate is preferably made from a single sheet of metal, stamped and bent, respectively to have the construction and shape shown. It is operated by a button having a stud secured to it, and working in a second slot formed in the price-changer below the coin-slot—the stud being secured to the slide-plate. It preferably passes through a plate which extends from opposite sides of the button, and is slid back and forth on the face of the price-changer in the movements of the button, and operates to cover at all times the second slot.

APPLICATIONS FOR LETTERS PATENT.

11,949.—Schoeler, F., "Measuring strength of light." May 26.

11,951.—Ward, H. H., "Automatic lighting of clocks or signs according to rise and fall of the sun." May 26.

11,975.—Smethurst, A. H., and Phillips, J., "Anti-vibrating device for supporting incandescent burners and mantles." May 26.

11,933.—Baertl, F., "Pressure-regulators for gas-burners." May 26.

12,022.—Foster, J., "Evaporating, concentrating, and recovering salts from ammonia liquors and the like." May 27.

12,034.—Ramsden, W. L., and Smith, H. E., "Gas-purifiers." May 27.

12,036.—Guthrie, M. and H., "Treating gases and liquids." May 27.

12,084.—Bronder, G. A., "Conveyors for retort-stacks." May 27.

12,139.—Southall, J., "Rotary engines operated by gas or other power." May 28.

12,152.—Parizot, F. C. M., "Self-igniter for gas-burners." May 28.

12,278.—Koch, R., and Rothenburg, L., "Incandescent gas-lamps." May 29.

12,360.—Bray, J. W., "Acetylene gas-burners." May 31.

12,362-3.—Crossley, W. J., and Rigby, T., "Gas-producers." May 31.

12,364.—Wright, G. E., and M'Neill, D. L., "Gas-fire interiors." May 31.

12,409.—Wiederhold, O., "Incandescent gas-burners." May 31.

12,440.—Beale, B. R., and Bagnall, A. E., "Coin-freed mechanism for gas and other meters." May 31.

12,445.—Graham, M., "Regenerative furnaces." May 31.

12,461.—Elworthy, H. S., and Williamson, E. H., "Manufacture of gas." May 31.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

The Halifax Inquiry Circular.

Sir,—In the "Journal" for the 27th day of May, 1902, there is a paragraph headed "An Inquiry Circular from Halifax."

I am requested to say that such circular was sent out without the knowledge of the Inquiry Committee. What they required was for our Engineer to get information on three things, from six places, and can assure you that we did not want to pick any man's brains, nor use any engineer's time unnecessarily.

Hope you will please give this letter the same publicity in your next issue, and oblige.

G. H. Wadsworth, Chairman.

82, *King's Cross Street, Halifax,*
June 5, 1902.

The Condensation of Coal Gas.

Sir,—In reading Dr. Colman's interesting communication, on "The Condensation of Coal Gas" (and, *inter alia*, the naphthalene controversy), in this week's "Journal," I was irresistibly reminded that the proposals for condensation as affecting the naphthalene question were advocated and employed years ago, more particularly in conjunction with improving the illuminating power of the gas made.

I would refer, in the first instance, to the *brochure* published at your office, in 1883, entitled "A New Arrangement of Hot Frictional Condensation for Increasing the Illuminating Power of Coal Gas," by John Somerville. The arrangement consisted of a series of baffle-plates placed in the hydraulic and condensing mains; and on p. 10 of the above it is stated: "By this arrangement, it will be found that some of the light hydrocarbons which usually pass away with the tar are retained, to increase the illuminating power of the gas; while the heavy tars of the naphthalene series are quickly thrown down and prevented from abstracting the light-giving hydrocarbons from the gas. Naphthalene is not produced; and thus it is prevented from forming obstructions in the street-mains and service-pipes."

I may mention that the baffles or screens (as illustrated in the *brochure* referred to), were used here by my predecessor—the late Mr. A. H. Wood—who was sorely tried with the naphthalene difficulty, both on and off the works. They proved, however, to be of no avail. The

theory, as advocated by Mr. Somerville in conjunction with the naphthalene difficulty, was also claimed for the St. John apparatus in a paper read at Birmingham by Mr. R. P. Spice before the Gas Institute in 1881, upon which a discussion took place, when this question of dealing with the naphthalene difficulty was fully referred to. In fact, there is no doubt that the naphthalene difficulty must be dealt with in *conjunction with condensation;* but I am strongly of opinion that condensation alone will not accomplish it with any certainty. A study of the conditions under which condensation is carried out on various works will not even inferentially furnish any reliable data; as, working under practically similar conditions, some works are troubled with naphthalene and others are not. There may be a moment when all the conditions may be just right; but the difficulties of keeping these conditions exact and constant are illimitable. Further, the constituents of different coals, and the methods of carbonizing, are so varied that the proportion of solvent oils carried forward as "tar fog" will be enormously different; so that I cannot agree with Dr. Colman's conclusions, in which he states "that the amount of light oils present in the hot gas, *even under the most unfavourable conditions*, is quite sufficient to affect the reduction of naphthalene to a safe limit."

Moreover, what is a "safe limit" that will be unaffected in a large and extending works by the variable conditions, unless that limit is really rendered practically negligible in the canalization by supplementing it with other means distinct from condensation alone? It may be that those who have at last woke up to the fact that there is an urgent necessity for grappling seriously with the naphthalene difficulty are unaware that others have years ago been forced to cope with it in order to retain their business.

Hastings, June 6, 1902. CHAS. E. BOTLEY.

The Glasgow-Jones Controversy.

SIR,—Mr. Glasgow must indeed be in extremity to answer my simple question of how he can make 16-candle gas for 1s. per 1000 cubic feet, when he stoops to misrepresent me. He had better at once admit that he has gone beyond what he can justify. HY. E. JONES.

June 9, 1902.

The Welsbach Settlement.

SIR,—I can assure your correspondent, Mr. Tapp, that no injustice has been done to his friend Mr. Radclyffe in rejecting his groundless claims.

Mr. Radclyffe was not an intermediary; he did not originate the idea of a royalty (in which there is no novelty), for it was agreed to before I had the pleasure of making his acquaintance; he had no part whatever in the negotiations with the Welsbach Company, and therefore has no claim for any reward from anyone.

The Guarantee Fund was not started with any idea of breaking up or wrecking the Welsbach Company, but simply to ensure a proper defence of the pending actions. My colleagues on the Boards of the South Metropolitan and Commercial Companies specially urged me to avoid litigation, if possible, and to do my utmost to obtain an amicable settlement; and I need hardly say I was in the most complete accord with them.

June 7, 1902. GEORGE LIVESEY.

Jointing of Purifier Lids.

SIR,—In the "JOURNAL" for May 20 (p. 1355) we notice an arrangement of purifiers as patented by Messrs. Smith-Rewse and Coates, of Darlington.

We may state that we have been manufacturing this kind of purifier for many years past, and have erected numbers of them in Germany, Switzerland, Sweden, &c. We fitted up the following gas-works with them: Olten, Wittstock, Wittenberge, Lauenburg, Christianstad, Diedenhofen, Schlettau, Znin, Borsigwerke, O/S., and St. Immer. We therefore claim priority of rights.

BERLIN-ANHALTISCHE MASCHINENBAU-ACTIEN-GESELLSCHAFT.

Berlin, June 5, 1902. Per E. BLUM.

The Incidence of Duties on Commodities.

SIR,—If you slap a man on the back as a friendly greeting, and in so doing knock him down, the fact that your purpose was amiable will not lessen the physical injury. It matters not whether the Chancellor of the Exchequer has imposed the corn duty solely for revenue purposes or not; its protective effect is neither lessened nor increased by the motive prompting its imposition. If anyone doubts the protective tendency of the duty, let him remember the enthusiasm with which its announcement was received in the House of Commons by the avowed Protectionists—the gentlemen who gave German trade such a splendid gratuitous advertisement by their successful advocacy of the Merchandise Marks Act, but who do not carry their patriotic economics so far as to consume only British wines and cigars—and in the press, by those writers who have been urging us for many years to give up the "fallacy of Free Trade."

As to the Match Tax which I am adjured to remember, but which has as much bearing upon the present question as Chinese has upon Shorthand, I would only remark that the fact that Mr. Ayrton "came a cropper" over his Match Tax no more demonstrates his foolishness in abolishing the shilling duty on corn, than do the flounderings of Sir Michael Hicks-Beach with the twopenny cheque duty (which made him the laughing-stock of all business men the other day), demonstrate his wisdom in re-imposing that corn tax.

When the shilling tax was allowed to remain as a registration duty on corn imports, it represented only about 1½ per cent. on the market price. It is now equal to 4 per cent. on the current price, and is quite sufficient to enable the English farmer to get a slightly better quotation for his corn than he would get if no impost had to be paid by supplies from abroad. If the English corn grower is not going to benefit by the duty, how is it that the horse-keepers (cab and omnibus proprietors, &c.) are crying out because the shilling is being added to contract prices? It is within my own knowledge that English forage contractors are charging the gas undertakings they supply the shilling duty, and of the shilling that is so levied the Exchequer does not get a single penny.

Moreover, however slight the effect of the shilling tax might be, that effect is Protective in its direction, and should therefore be resisted vigorously; for there is nothing sacred about the shilling—if one, why not two, three, four?—and it is always easier to oppose the first step, which is a matter of principle, than the second, which is a matter of degree. It is obvious already that our departure from Free Trade is going to land us in the quagmire of preferential duties for Colonial goods, which, with their plenteous opportunities for engendering friction and jealousy between different parts of the Empire, may do more to loosen the silken bonds that unite those parts into the extraordinarily powerful combination that is the present despair of our rivals than the War has done to tighten them. It is time that business men—who, and not the scholastic political economists (necessary as they are), have always been the back-bone of the Free Trade movement in this country—woke up to the fact that the foundations of our commercial prosperity are being steadily mined by some men who are interested parties, and by others who, from want of understanding or want of study, are the unconscious tools of those who would benefit by Protection.

You say that you do not understand my arguments except upon the assumption that I disapprove of all import and export duties. But that by no means follows from my objections to the coal and corn duties. One may with perfect consistency approve of import duties upon wine, cigars and tobacco, tea, coffee, cocoa, sugar, silk, and other commodities not produced in this country, if the Exchequer requirements of the country render such duties necessary, and at the same time, and on equally good grounds, strongly disapprove of duties which—whether introduced for the purpose or not—have a protective effect through being imposed upon commodities produced in this country. I object to the coal and corn duties, not because they are export and import duties, but because they are based upon false principles of economy, and are duties that ought not to be imposed unless, nor until, every less harmful form of taxation has been exhausted. And no one will persuade me that we are in those straits yet. "Beer and 'baccy" are not rendered luxuries by taxation so far.

June 6, 1902. FREE TRADER.

[Instead of bandying phrases about what are Protective and what are Revenue duties, and begging the whole question that Protection is essentially unphilosophical and unscientific—regardless of the object of the proceeding or the desert of the thing protected—our correspondent had better sit down and draft a scheme of national taxation such as he would be prepared to defend as perfect. We are quite satisfied with the present taxes, having regard to the needs of the country; he evidently is not. Let him show a better way. It was not Mr. Ayrton, by the way, who proposed the match-tax; but that very flawless and philosophical economist, Robert Lowe. It is always easier to remove, demolish, and destructively criticize than to put something better in its place. That is the moral of the match-tax.—ED. J.G.L.].

Public Lighting at Plymouth.—The Electricity and Street Lighting Committee of the Plymouth Town Council, who own the electric light works but not the gas-works, have declined to allow the Gas Company to put up a Lucas lamp, as an experiment, in part of the gas-lighted area. The Company offered to fix the lamp free of cost, to maintain it for three months, and to provide the gas used in excess of that now consumed in a 2-burner incandescent lamp on the site. The fact that, notwithstanding its subsidy from the street lighting, the electricity undertaking cannot pay its way, may have something to do with the rejection of this offer.

Improved Public Lighting in Calcutta.—Great satisfaction is being expressed in Calcutta at the efforts of the Oriental Gas Company to improve the public lighting. A writer in the "Hindoo Patriot" for the 11th of April went so far as to say that the city was "charmed" with the change, and that the Company deserved substantial congratulation on the results lately achieved. The new burners to the street lamps and the brilliant, though mellow, incandescent lights were thoroughly appreciated by the residents; most of the big streets now being supplied with them. A correspondent writing from Hastings expressed the highest satisfaction of the residents there at the improved lighting in the streets of that suburb. He compared the effect of the light to "bright moonlight," and said most people were delighted with the general improvement in this direction. He urged that the matter was one deserving the congratulation not only of the Municipality, but of the Company responsible for this improved state of things.

The Gas v. Electricity Dispute at West Bromwich.—At the meeting of the West Bromwich Town Council last Wednesday, the Chairman of the Gas Committee (Mr. Bushell) proposed that the comparative cost of gas and electricity for lighting purposes should be established by official tests independently carried out at the Town Hall for a period of not less than 500 hours. He pointed out that the public were becoming bewildered at the statements and counter-statements that were made with regard to electricity and gas, and he hoped the municipal campaign that had been going on for so long would, like the South African war, speedily come to a peaceful end. Alderman Salter seconded the motion. Alderman Pitt explained that the circular which was considered objectionable had been withdrawn; but Mr. Bushell said he desired also the withdrawal of the Chairman of the Electricity Committee's assertion that electricity was cheaper than gas. After some discussion, Mr. Bushell's proposition was lost by eight votes to five. At a subsequent stage, Mr. Bushell asked the Mayor to accept his resignation as a member of the Gas Committee. His decision was, he said, final so long as the dispute between the Gas and Electricity Committees remained in its present condition. Here the matter rests.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

In these days, a Gas Bill has become such a rarity in the Committee Rooms that the appearance of the Broadstairs Gas Company's Bill before a Lords Committee, with the prospect of a good fight, was something to reawaken interest, and from Wednesday to Friday one was not disappointed. While, speaking generally, the waste of money which some Bills produce through prolonged and double hearings over trivial points is to be deplored, this is a case in which the opposition had good and reasonable ground for complaint and hostility; and if the Company have been put to considerable expense in trying to carry their Bill, it must be put down to the uncompromising attitude which they themselves adopted. But more about this Bill presently. Preceding the Broadstairs Bill in the list of measures which were referred to the same Committee was the Abercarn District Council Bill, which is to authorize the promoters to purchase the gas-works on agreed terms or otherwise by arbitration. A petition had been presented by the Gas Company praying to be heard by Counsel against any alteration in the Bill; but presumably matters were righted to their satisfaction, for the parties did not appear, and the Bill has gone forward as an unopposed measure. It was expected that the Commercial Gas Bill, after the settlement arrived at in the Commons, would have gone forward without any further question. But the same Committee of the Lords also had it in their group; and it transpires that there were one or two petitions lodged against it. But they were, we believe, connected with matters of little moment. In this case, too, the parties have evidently taken the better course, and settled their differences out of Court—seeing that the measure has been removed from the opposed to the unopposed state. The Rickmansworth Gas Bill will, unless the good fortune of a settlement comes along, be before Sir John Brunner's Committee shortly. It may be remembered that opposition was offered to it in the Lords; but non-compliance with Standing Orders by the Local Authority prevented its prosecution. The Longwood Gas Bill, as will be seen below, will not further engage the attention of a Select Committee.

The Defeat of the Broadstairs Gas Company. There was considerable rejoicing in the lobby outside Room No. 1 last Friday afternoon, when Lord Hawkesbury had made it known that the Bill of the Broadstairs Gas Company could not proceed with the clauses embodied in it referring to the site proposed to be acquired for the purposes of new gas-works. The decision of the Committee was not given without due and full consideration. For the greater part of three sittings, they had patiently listened to the best that could be said for the site; and they had abundant evidence to show that, in this matter, the Company had opposed to them not only the District Council, but some of the most influential residents, and the ratepayers generally. The facts of the case were stated fully when the Bill was before the House of Commons Committee. To be brief, they were these: The Company sought, among various ordinary powers, to acquire a new site for gas-works; and the one they had chosen abutted on the railway near the station, so that one of the first things that visitors to this increasingly popular seaside resort would have cast their eyes on (had the Company been successful) would have been the gas-works, and it follows that one of the last things they would have seen as they quitted the town would also have been the gas-works. Residents near the site, too, objected to gas-works being planted, for both private and public reasons, in what will, in the natural course of circumstances, become the most important part of the town from a business point of view. It is only within the last few years that the town has attained its great popularity; and this is largely owing to the resolute and successful enterprise of the governing body and the people. The old business part of the town is congested and inconvenient for the growing traffic; and it is not difficult to foresee that the time is fast coming when from the railway station to the sea will form the main business centre both for shopping and for residential purposes for visitors of the class who form the backbone of support, through superiority in numbers, of a holiday resort such as Broadstairs. Therefore, although this site may have been the best from the gas maker's point of view, in the highest interests of the town (upon the continuous progress of which the Gas Company must look for their increased success), the second best site is certainly the one to have preference, and must perforce now. The Commons Committee before whom the Bill first came would never have imposed the strange conditions they did upon the use of the site for gas-works purposes if they had not felt some sympathy with the views of the town on the subject. A screen of trees 30 feet wide on certain sides of the works, and the restriction of the gasholders to a height of 20 feet above the surface of the ground, were sufficiently novel to raise a smile on the faces of many gas men, and to provoke criticism from the point of view of constructional costs. Even this provision for mitigating any offence the works might have caused in that particular place did not satisfy the inhabitants of the town. On the contrary, to use the words of the Vicar of St. Peter's parish, the decision provoked a feeling of "absolute astonishment and indignation" among the people; and they determined to contest the granting of the site to the bitter end. The Company were equally headstrong; and they have now to pay the penalty, and to do that which it would have been far better for them to have done in the first place—that is, find the second best site for their purpose.

A Determined Fight. Both parties came before the Lords Committee in a determined spirit, and prepared to fight the question of site step by step. On the Company's side were Mr. Balfour Browne, K.C., Mr. Ernest Moon, K.C., and Mr. W. Shakespeare; and for the District Council (who represented the inhabitants) and the landowners were Mr. Wedderburn, K.C., Lord Robert Cecil, K.C., Mr. C. C. Hutchinson, and Mr. H. Smith. Backing the Company as experts were Mr. H. E. Jones, Mr. George Livesey, Mr. E. H. Stevenson, nd Mr. Robert Porter; and there were also the Chairman of the Company (Mr. Lazarus Hart), the Manager and Secretary (Mr. Frank Higginson), other Directors, and estate agents. Seated behind the legal representatives of the opponents were Mr. W. A. M'Intosh Valon, Mr. Charles Hunt, Mr. Charles Gott, Mr. Percy Griffith, the Vicar of St. Peters, local estate agents, and quite a numerous retinue of local people—all of whom, if necessary, were prepared to give their testimony. The eminence and number of the witnesses retained by the Company showed their determination to get the site through at any cost; and the strengthening of the evidence of the opponents disclosed the determination actuating their resistance. It is difficult to call to mind a case in the Committee rooms where there has been such a sharp division of opinion between a Company and the people they serve over a single question as in this particular one, nor a more obstinate struggle on the part of both sides.

A Questionable Policy. The Company have lost the objectionable site; and therefore, the evidence being reported elsewhere, there is no need to deal with the arguments here, excepting in regard to one point. Granting that going to another site—say, the one suggested by the District Council—will make a difference of a penny or so on the price of the gas, surely gas a penny or so cheaper is not the pre-eminent consideration for a place like Broadstairs. But the Company and their advisers really seem to think so. That there are other interests to be considered, and that the good will of the people is something worth maintaining and cultivating, are points that the Company haughtily ignored; and nothing short of the House of Lords sufficed to assure them of their mistake. There was nothing conciliatory about their attitude. "Here we are, and here we mean to stand, unless a higher power than the people of Broadstairs kick us out" was what they said in effect to the very people to whom they have to look for custom. The higher power has kicked them out; and that is perhaps the very best thing that could have happened to them. If the Company had got the site, it would have been a memorial in the eyes of the inhabitants of Broadstairs of the Company's defiance of them and of what the people regard as the best interests of the town, and that would not have been to the Company's advantage. As it is, they have to live down the ferment which they themselves have stirred up in the town in which they have to earn their profits. The moral of this defeat is that local companies must remember that there are other interests than their own to be taken into calculation; and that, for the sake of ensuring a continuance of good relationship, those interests must be studied, and studied generously. The Broadstairs Company have had a very expensive lesson. They arrayed themselves against the best opinion in the town; and they have had a heavy fall. The other points which were urged were of smaller importance; but it may be mentioned that, following upon the decision as to the site, the capital asked for was cut down from £40,000 to £9000 and the usual borrowing powers. The Company will have to come again with a fresh site proposal, and they will then have to ask for the necessary capital for the new works. It must be said in conclusion that both sides worked powerfully for their respective causes. But there is no denying that the puissant speech of Mr. Wedderburn, for the opposition, told very heavily against the Company.

Huddersfield v. Longwood. Evidently for the purpose of avoiding large expense in a second bout with the Huddersfield Corporation, the Longwood Gas Company (who came off so victoriously when they met the Corporation in the Lords) have made certain concessions, by which the opposition of the Corporation in the Commons is to be withdrawn, though there is little doubt that the Company would have been equally successful on their second trial as on the first. But at what cost? The terms on which an agreement has been effected are that the standard price of gas is to be lowered from 3s. 2d. to 3s. 1d. per 1000 cubic feet, and that the new capital is to be reduced by £20,000. This will necessitate the Company's return to Parliament earlier than they would otherwise have had to do; but they have secured enough to last them several years. If it does not, it will merely mean that greater prosperity has attended their business than they anticipated.

Vexatious Opposition and Costs. The Nottingham Corporation have had their knuckles rapped twice this session over the Buxton District Council Water Bill, which proposes to secure an additional water supply and to construct further reservoirs. The Corporation of Nottingham obtained a partial *locus* in the House of Lords; but, after hearing their case, the Committee of that House told them that, had they appreciated at first the position of the Corporation, they would not have heard them even to the extent they had done. Their contention is that the abstraction of water proposed under the Bill will be to the detriment of Nottingham; but their rights exist some 77¾ miles below Buxton's catchwater! The Corporation, on the same ground, again brought the Buxton Council, their legal representatives, and a number of expert and local witnesses before Mr. Heywood Johnstone's Committee last Thursday. The Engineer to the scheme (Mr. G. H. Hill) declared that no damage could result from it to Nottingham; but Mr. Erskine Pollock, K.C., for the Corporation, pleaded that compensation water should be given. The Committee pronounced the preamble of the Bill proved, and added that as Buxton proposed to take the water from their own district, the suggestion that this would injure Nottingham was trifling. Thereupon Mr. Balfour Browne, K.C., for the promoters, saw an opportunity for making Nottingham smart for their unwarrantable and vexatious antagonism, and he asked for costs against them. After consideration, the Committee were unanimously of the opinion that Nottingham ought to pay the promoters the costs of the day, less the expenses of the witnesses called. The opposition, in their view, had been not personally, but legally, vexatious. As we have said before, the application of this power a little more frequently by Committees would work well in the suppression of unreasonable quarrelsomeness and hostility.

Barnsley Water Borrowing Powers. A Bill confirming a Provisional Order of the Local Government Board relating to the Barnsley Corporation water undertaking has been reported for third reading by the Deputy-Chairman of Ways and Means (Mr Jeffreys). It empowers the Corporation, with the sanction of the Board, to borrow in addition to the amounts they are already authorized to borrow, such sums, not exceeding in the whole £120,000, as

may be necessary for their water undertaking, and as are properly chargeable to capital.

House Water-Fittings and Contamination.

Sir Chandos Leigh, the Speaker's Counsel (who by the way is a Director of the Imperial Continental Gas Association), has been persistent in getting a little, but necessary, amendment made in the Bill of the Abertillery District Council, which is intended to confer power to construct additional water-works and to make further provision in regard to the undertaking. The Bill has already passed through the House of Lords; and is now in the Lower House. Last Tuesday it came before the Deputy Chairman of Ways and Means, as an unopposed measure. It is in clause 20 that Sir Chandos has interested himself. It provides that "the Council shall not be compelled to supply with water any water-closet, or the apparatus or pipes connected therewith respectively, unless the same be so constructed as to prevent contamination of the water of the Council, provided that the foregoing provisions shall not entitle the Council to cut off or discontinue the domestic supply of the house in which the water-closet is situated." Sir Chandos is strongly of opinion that the words "or any bath" should follow water-closet. He made a representation to the Local Government Board on the subject; but the House of Lords cut out the proviso. However, there has since been a consultation with Mr. Albert Grey, Lord Morley's Counsel; and the desired additional words "or any bath" have now been inserted. With this amendment, the Bill has been directed for third reading in the Commons; but it will have to formally go back to their Lordships' House.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Huddersfield Corporation Bill, Leamington Corporation Bill, Local Government Provisional Order (Gas) Bill.

Bills read a second time and committed: Bedford Corporation Water Bill, Chard Gas Bill, Gas Orders Confirmation (No. 2) Bill, Gas and Water Orders Confirmation Bills (Nos. 1 and 2), Knaresborough Improvement Bill.

Bills reported: Consett Water Bill, Leyland and Farington Gas Bill, Paisley Gas Provisional Order Bill, Whitstable Improvement Bill.

Bills read the third time and passed: Coatbridge Gas Order Confirmation Bill, Leicester Corporation Bill, Limpsfield and Oxted Water Bill, Margate Corporation Water Bill, Omagh Urban District Gas Bill, Paisley Gas Provisional Order Bill.

The Committees to whom the Abercarn and Commercial Gas Bills were referred did not proceed with their consideration, no parties having appeared in opposition thereto.

The West Ham Gas Bill and the Kent Water Bill have been referred to a Select Committee, consisting of Lord Brougham and Vaux (Chairman), the Earl of Romney, Lord North, Lord Colchester, and Lord Muncaster; to meet to-morrow.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bills read the first time and referred to the Examiners: Leicester Corporation Bill, Margate Corporation Water Bill, Paisley Gas Provisional Order Confirmation Bill.

Lords Bill read a second time and committed: Bristol Water Bill.

Lords Bills reported, with amendments: Abertillery Urban District Council Bill, Bradford-on-Avon Gas Bill, West Hampshire Water Bill.

Bills read the third time and passed: Chigwell, Loughton, and Woodford Gas Bill [Lords], Leamington Corporation Bill, Local Government (Ireland) Provisional Order (Gas) Bill, Local Government Provisional Order (Gas) Bill.

HOUSE OF LORDS COMMITTEE.

Wednesday, June 4.

(*Before Lord* HAWKESBURY, *Chairman*, *Lord* HAMILTON OF DALZELL, *Lord* DIGBY, *Lord* SALTOUN, *and Viscount* HILL.)

BROADSTAIRS GAS BILL.

By this Bill, which has already passed the House of Commons (*ante*, pp. 568, 645), the Broadstairs Gas Company seek further capital powers and the compulsory acquisition of land for new works. It was opposed by the Broadstairs Urban District Council on the question of capital; and the Council also asked for the insertion of an option of purchase clause, empowering them to bring up a Bill for purchase next year. Certain landowners opposed on the ground of interference with property. When the Bill was before the House of Commons, an alternative site was proposed by the Council, but was rejected by the Committee. The site suggested by the Company was accepted; but the obligation was put upon them by the Committee to plant trees on either side of the works, and to keep the gasholders below a certain height, in order to make the works generally less prominent. To-day, before the Lords Committee, another alternative site was brought up by the Urban District Council for consideration.

Mr. BALFOUR BROWNE, K.C., Mr. ERNEST MOON, K.C., and Mr. W. SHAKESPEARE appeared for the promoters; Mr. WEDDERBURN, K.C., and Mr. C. C. HUTCHINSON represented the Urban District Council; and Lord ROBERT CECIL, K.C., and Mr. H. SMITH appeared for certain landowners.

Mr. BALFOUR BROWNE opened the case for the promoters on the lines adopted before the Commons. The main matter to be raised was as to the site. The alternative site now proposed by the Council was entirely different to that brought forward in the other House.

Mr. WEDDERBURN said both had been suggested there.

The CHAIRMAN: Are you going into the alternative site?

Mr. WEDDERBURN said he proposed to show the Committee that it would be easy to have another site, and also that the one put forward by the Company was open to great objection. Everybody in Broadstairs, except the Company, was against it.

Mr. BALFOUR BROWNE denied that. He asked their Lordships not to allow the new alternative site to be discussed. It had not been proposed before; and there might likely be strong opposition by the landowners there.

Mr. *Lazarus Hart*, the Chairman of the Company, repeated the evidence he gave before the House of Commons Committee.

In cross-examination by Mr. WEDDERBURN, witness said he was not aware that the Council, of which he was a member, were unanimously against the proposed site.

Mr. WEDDERBURN: Do you know that, almost without exception, the whole of the ratepayers of Broadstairs are against it?

Witness: Quite the contrary. They went round with a petition, and told persons that it would be most injurious to them if they did not sign the petition. Some of the people were not at home; and wives signed for their husbands. The old works are inconvenient, because they are surrounded by buildings. The residual products have to be carted through the streets, which is injurious to the town.

Therefore it would be undesirable to build any new gas-works in a place that might ultimately become the centre of the town?—I do not think it would be undesirable at all.

Do you know the people of Broadstairs are opposing this Bill in both Houses at great expense (which means a considerable increase to the rates this year), because they feel that the prosperity of the place depends upon it?—I do not think they took that into consideration at all. They have an ulterior object in view, if you ask me. They thought if they could manage to get the Committee of the House of Commons to throw out our Bill upon the last occasion, they would promote a Bill the next session to purchase the undertaking.

Would not it be a solution of the problem for them next year to buy up the gas-works, because they could then put the site where they thought it would be suitable?—I cannot answer that.

Is this site essential to you?—Yes.

Do you seriously suggest that you cannot go on for another year without at once building these new gas-works?—I do.

If it be the fact that the limitation in the Bill of the gasholders to 20 feet means a large increase in the cost of gas to the consumers, you would not call it an economical site?—I should, for other reasons besides the gasholders. We have already a gasholder at Dumpton; and we could put another one or two up there.

Are you content to build no gasholders on the new site?—I cannot go so far as that. If our Engineer should inform us that it would be too expensive to put up the gasholder there, we have land at Dumpton where we could erect one or two.

Mr. WEDDERBURN was proceeding to put the new alternative site before the witness, when

Mr. MOON asked that this should not be allowed.

The CHAIRMAN: Take it very shortly.

Mr. WEDDERBURN said, of course, one could not go into an alternative scheme in anything like detail. But surely as the allegation was made that the site proposed by the Company was the best and cheapest, he was entitled to show that it was not so.

Lord R. CECIL urged that he could not put the case of the landowners properly before the Committee unless the alternative site was referred to.

The CHAIRMAN said the Committee would hear Counsel on the point; but they desired it to be gone into shortly only.

A photograph of the site suggested by the Urban District Council was then handed to witness.

In reply to Mr. WEDDERBURN, witness said he was not aware that it was an acre larger than the Company's proposed site, nor that there were only two cottages within 300 yards of it.

In cross-examination by Mr. SMITH, witness generally denied that the erection of the works, with the restrictions imposed by the Commons Committee, would be detrimental to surrounding property.

In answer to a member of the COMMITTEE, witness said the site suggested by the Council was outside their area. The Company did not know what they would have to contend with there. It was, however, within the Company's limits of supply.

Mr. MOON (in re-examination): You are entitled to use the land at Dumpton for gasholder purposes?

Witness: Yes; but not for any other purpose.

You could not manufacture gas there without going to Parliament; and right away out there, with no railway connection at all and a roundabout road, you could not satisfactorily do this so as to enable you economically to supply Broadstairs?—We should not be able to supply gas at the price we are charging now.

Thursday, June 5.

The CHAIRMAN said the Committee were strongly of opinion that the alternative site must not be gone into fully, but only referred to casually.

Mr. WEDDERBURN said the Committee's expression of opinion would be acted upon.

Mr. SHAKESPEARE did not propose to go into the alternative site at all, but would leave it for cross-examination.

Mr. *Frank Higginson*, Engineer, Manager, and Secretary of the Company, examined by Mr. SHAKESPEARE, gave the figures relating to the undertaking which have already appeared in our columns in connection with the earlier proceedings on the Bill.

In cross-examination by Mr. WEDDERBURN, witness said the further capital asked for was £40,000; but he did not know how much of this was required for the new site. The existing site had been found inconvenient, because of its being in the centre of the town. A site upon the

railway, no matter what the position, would not answer the purposes of the Company. The House of Commons had only granted the site on condition of shutting in the works, and having low gasholders. As telescopic holders were economical, the site started with the disadvantage that they could not do with it what experience had shown to be the cheapest thing.

Mr. WEDDERBURN: A three-lift holder of a capacity of 300,000 cubic feet would cost £3750, or about £12 10s. per 1000 cubic feet, while two side by side of the same capacity would approximately cost £6600, or £21 per 1000 cubic feet. If I prove these figures, does not that show the disadvantage of extravagance?

Witness: Yes.

And extravagance of this kind means that the consumers will have to pay more for the gas?—Yes.

Therefore you will be forcing upon the people a site against their will, and at the same time compelling them to pay more for their gas?—If you are correct in your figures.

A bridge such as you will have to make cannot be very cheaply constructed?—It depends upon the kind of bridge.

In answer to further questions, witness said that the height above Ordnance datum of the site proposed by the Bill was 110 feet, not 128·75 feet, as suggested by Counsel. The height of the site proposed by the Council was 120·10 feet. He did not suggest that the best class of property was as a rule built in the neighbourhood of gas-works; but it had been proved in the other House that a very good class of property surrounded the Company's present works.

Mr. MOON admitted that if the site proposed were now covered with buildings it would not be so suitable as it was.

Mr. *H. E. Jones* repeated the evidence given by him before the other Committee. He pointed to the case of Watford as an instance where a good class of property existed near the gas-works.

Lord R. CECIL objected to an analogy being suggested between the two places.

Witness said that the site proposed by the Council was most objectionable. The Chairman, Mr. Hart, and he had been to look at the site since the earlier proceedings. From it, they could see all the prominent buildings in Ramsgate and Margate, and it was close to St. Peter's Church. One got commanding views of the residences of Mr. Harmsworth and other gentlemen. Twenty times as much damage would be done from the sentimental point of view by the Council's site as by that of the Company. The Council's site was a very much greater distance from the town. If the Company had to pay the cartage of the coke, it would increase the cost of gas; and, on the other hand, if the purchaser had to pay it, it would make the coke dearer to him. The cost of carting coke from the Council's site would be prohibitive.

Mr. MOON: In the petition of the Council there is a suggestion that the Committee should put in a clause giving them power to purchase the undertaking. Is there a precedent for such a clause.

Witness: I do not know of one; and I do not see any ground for it, because they do not allege at all that we have abused our power or failed to give them a good service.

As regards the standard price, that was fixed in 1883?—Yes.

The Council are now suggesting that it should be reduced. Has the whole of the capital issued since 1883 been raised by auction in the market, upon the faith of the standard price being 4s. 4d.?—Yes.

In cross-examination by Lord R. CECIL, witness said it was quite possible that Major Marindin had stated in his report some years ago, when the site was proposed, that unless the promoters could prove there was no other available site they should not be allowed to injure neighbouring property. The Company had then gone to Dumpton.

Lord R. CECIL: Do not you think it would be better to do your manufacturing outside the town?

Witness: That is precisely what we are proposing to do.

You regard this as outside the town?—Yes.

Witness, in further cross-examination, denied that there was any place near the site suggested by the Council which was sereened by trees, by rising ground, and by the electric light station. He admitted that the trees which were to be planted round the works at the Company's site would not be of much value to the neighbouring landowners for some time to come; but the promoters had done the best they could to meet their objection.

Mr. WEDDERBURN (in cross-examination): Did you consult the Council with regard to your proposed site?

Witness: No; I should never have dreamed of going to such people.

What have they done?—In every town it is the same; the natural enemy of a gas company is the local authority. They either want to buy them up or to bully them or drive them out—anything rather than let them go on with their business. I should not dream of consulting them about a site. I did go to the landowners.

Do you know the people of Broadstairs have experts as eminent as yourself who say the site you have chosen is the most objectionable possible, and that the one we have selected is free from these objections?—Then I am very sorry for them.

You know Mr. Balfour Browne said this site would cost the Company very dear?—We have had it that land near has been sold for £500 per acre; but they have not been able to dispose of this land, which has been for sale for twenty years. When we gave our notice, they raised the board again.

Would not the whole matter be settled by a clause in the Bill carrying out the earnest desire of the people of Broadstairs that they should come for a Bill next year to purchase the Company?—Why?

Then they can fix their own site?—If they go to a qualified engineer, he will recommend this site.

Are Mr. Valon and Mr. Hunt qualified engineers?—Yes. I shall be surprised to hear them say this is not the best site.

Mr. WEDDERBURN: Then reserve yourself for surprises.

Mr. MOON said it was the object of the Council to try to cripple the Company, in order to make the undertaking cheap.

Mr. WEDDERBURN said the sole object of the Council was to protect the prosperity of Broadstairs, to which the site proposed would be fatal. If the site of the Company were put in, they would press for a purchase clause; if the site were rejected, they would not ask for such a clause.

Mr. MOON; But my friend will bring in a Bill proposing to purchase the Company in its crippled state. Would it be fair to buy the undertaking in its present position?

Witness: Certainly not, because we are disabled at present. We cannot make gas economically on that little crowded works.

Mr. MOON, in answer to the CHAIRMAN, said he had several more experts, but would only call Mr. Livesey and Mr. Stevenson, and take them shortly.

Mr. *George Livesey* said a difference in a site might easily make a difference of 1d. or more per 1000 cubic feet. At present, the Company obtained their coal cheaply by barge from the Thames. The proposed site was not very far away, and coal could easily be carted there; but the increased cost of taking it to a site a good distance off, and the increased expense of getting rid of the residuals, together with the additional cost of laying mains, might easily run to 1½d. to 2d. per 1000 cubic feet as a perpetual charge on the consumers. For the cheap manufacture of gas the proposed site was as good a one as could be selected; and certainly gas could be manufactured there cheaper than at the alternative site proposed by the Council. Practically all the houses adjacent were of a class which would not be damnified by the erection of the gas-works. The construction of gas-works did not prevent good houses being built near them.

Cross-examined by Lord R. CECIL: He had not made any estimate of the cost of the site proposed, as compared with the alternative site by the electric light works.

Lord R. CECIL: You have no means of knowing what the price of land and damages for injury in the two cases would be?

Witness: I should think about the same. I do not like the shape of this site. If the Company take this site, they ought to take 10 acres. It is a very awkward shaped piece of land to take out of property.

I am obliged to you. If it could be shown that the effect of taking a site like this in the middle of a building estate, as we shall show it to be, would be to add very greatly to the cost, that would be a very serious matter?—Of course, it would. It would be better to buy agricultural land than building land.

And it might easily be better to go further away?—It might be.

Adding to the cost of the mains, even if you had to pay something additional for them?—If they balance, I would go further away to meet everybody's wishes.

Mr. MOON (in re-examination): Have you any doubt, as between the two sites, that what is best for the community of Broadstairs is that the gas-works shall be put upon the site which adjoins the station?

Witness: I think so, certainly.

Mr. *E. H. Stevenson* agreed that the site proposed by the Company was the only one within the area of the Council, and the best site within the district of supply. With regard to the point of economy in the manufacture of gas, it was an admirable site.

Mr. BALFOUR BROWNE said that, in deference to the wish of the Committee, no further experts would be called.

Mr. *William Lewis, J.P.*, proprietor of Margate College, and a member of the Kent County Council, said the College adjoined the Isle of Thanet Gas-Works. He had never experienced any annoyance from that proximity, nor received any complaints from his 400 pupils.

Mr. *Edward Brown*, plumber, living within 70 yards of the Company's existing works, said he had found the value of his property within 500 feet of the works had increased in value in recent years. He was not aware that there was a strong feeling among the people of Broadstairs against the proposed site.

Mr. *Frank Newman*, auctioneer and valuer, said he had examined the neighbourhood, and came to the conclusion that the erection of gas-works on the site proposed by the Company would not affect the building of houses near it at any future time. It was peculiarly fitted for the erection of such works with regard to the point that they could not be easily seen. The works would be far less conspicuous if built according to the Company's plan than the Council's.

In cross-examination by Lord R. CECIL, witness admitted there were two houses of good class near the proposed site. If further houses were built, they would be looking in at the back doors of Broadstairs; and he did not think it was likely that such good-class houses would be increased in numbers there. He did not agree that gas-works being erected would have any effect upon the class of houses built.

Friday, June 6.

Mr. *Rennolls*, auctioneer and estate agent of Broadstairs, examined by Mr. BALFOUR BROWNE, said the site chosen by the Company for their new works was an exceptionally good position for such works. The portion of Lloyd's estate which it was proposed to acquire for the purposes of the works had been in the market for many years. The estate was awkward to develop; the nearness of the upper part to railway lines and sidings being a deterrent to building operations. The proposed site was only suitable for the erection of small property. The works would not interfere with the development of the estate. There was no other site in the town so suitable for gas-works.

Cross-examined by Mr. WEDDERBURN: He did not agree that the people of Broadstairs were opposed to this project, or that the existing gas-works had retarded the development of adjacent property.

Cross-examined by Lord R. CECIL: It would not be advisable to erect high-class property on the proposed new site.

Mr. *Hinds*, surveyor and house agent of Ramsgate, examined by Mr. MOON, said the placing of the gas-works on the proposed site would cause no damage to property in the immediate neighbourhood. Messrs. Lloyd's estate, which had for a great many years been in the market, had not developed, owing to the near proximity of the railway-siding, and its very bad gradients and approaches. If the works were erected on the site in question, they would be screened from property on the other side of the line by intervening trees, houses, and the railway embankment.

Cross-examined by Mr. WEDDERBURN: Broadstairs was developing very rapidly. Unless there was a serious reason, from the gas-works point of view, to the contrary, it was desirable to put the works as far away from the population as possible.

This closed the evidence for the promoters.

Mr. WEDDERBURN, in opening the case for the Council, referred

first to the standard price, in regard to which the whole principle, he submitted, was that the margin between the standard price and the actual price should not be too great. Originally, in 1883, when the standard price was fixed at 4s. 4d., the price was 4s. 2d. per 1000 cubic feet; and there was thus a margin of 2d. The proposal now was that, although the price of gas was only 3s. 3d. instead of 4s. 2d., the same standard was to be preserved. This would give a margin of 1s. 1d., instead of a margin of 2d.; and it meant that the power of adding 3s. 6d. to their dividend, instead of being limited to twice 3s. 6d., was enlarged to thirteen times 3s. 6d. When coming for fresh powers, it was usual for Parliament to review entirely a Company's position; and if necessary they could reduce the standard price. Sir James Rankin's Committee on the Metropolitan Gas Companies stated in their report that they had come to the conclusion that a reduction of the standard price could fairly be recommended, on the ground that the cost of producing gas was now much less than when the present standards were fixed. This principle applied to other companies besides those in the Metropolis, and it also was an answer to the argument that the standard price should not be altered because capital had been raised on the faith of it remaining unaltered. If, however, this argument were to prevail, in the present case it would only apply to the capital of 1883. He submitted that the Committee had full power to reduce the standard price in regard either to all the capital or only to the new capital raised. It was done by Lord Camperdown in the Lea Bridge District Gas Company's case; and surely, having regard to the changed circumstances and the very great difference in the actual price charged, it was right that the Committee should reduce the standard. He urged the Committee to say that the standard price should now be 3s. 9d.—giving a variation on the actual price of 3d. Turning to the all-important question of the site, as representing Broadstairs, he said he was not concerned with the grave injustice which it was clear might be worked to individuals if the Committee sanctioned the site proposed; but if hereafter, at the last moment, suggestions were made that the case of the landowners might be met by special terms as to compensation, he should ask to be heard on them, because, representing the gas consumers, he should be opposed to any such proposal, which must mean an increase in the price of gas. It followed from this, he thought, that the only safe and just course for the Committee was to reject the site proposed. Nothing but subsidized evidence had been given in support of the Bill; not a single resident, *qua* resident, having spoken in its favour. Broadstairs depended on its air and its appearance; and anything which would destroy the amenities of the place would be fatal. Therefore to plant the new works at a place where, as the train ran into the town, the first thing seen, between the train and the sea, would be the gas-works, would be most absurd. Why were the works to be planted in the very place which they heard was being built round, and which would become the very centre of the town. If this were allowed, the Company in a few years, would want to remove the works. The conditions imposed by the House of Commons on the use of the site at once threw suspicion on it, because it must now be admitted that, without special treatment and special limitations, it was a bad site. The House of Commons Committee said trees were to be planted, and the gasholders were not to be higher than 20 feet. But the Council and the landowners were never heard on these two points. The proposal to plant trees was most absurd, because a horticulturist who would be called would say that to do this it would be necessary to dig out the chalk, and fill in the space thus created with soil; and then, possibly in ten or fifteen years, the trees, which would protect nobody and nothing, would grow. The limitation that the gasholders were only to be 20 feet high was objectionable, because it must mean dear gas. The site was not economical for five reasons. First, because the limitation of the size of the gasholders would mean, roughly speaking, a double expense; secondly, because a bridge would have to be built from the railway embankment to the site, which was not so cheap as running on the level; thirdly, because the trees, with their poor protection, meant the cost of digging out the site, planting the trees, maintaining them with manure, and so on; fourthly, because the site was very expensive—Mr. Balfour Browne himself having said they would have to pay very dearly for it; and, fifthly, because, having paid a high price for the land, a great deal of it would have to be devoted, not to gas manufacture, but to the planting of trees. Of this extravagance, seven-eights would fall on the consumers. It was said that in three years the Company would manufacture three times as much gas as at present. How could they do this, in their little wood, and on their restricted site? With regard to the alternative site, he said it was as ample as the one proposed, it was as near the railway, it was farther away from what must become the populous part of the town, it was much cheaper, it was within the area of the Company, and it was close to the power station. If that site had been put forward, the Bill would probably have been unopposed. If the Bill was not thrown out, he suggested that it would be fair to say the site should be given to the Company, but that they should take no step towards acquiring it for a year; and that if the Broadstairs people showed their *bonâ fide* objection to the site by deciding to purchase the undertaking, they should be allowed to do so. They would then get the whole thing in their own hands, and could go to their own site. This would be one solution of the difficulty, though not such a good one as refusing to allow this part of the Bill to proceed; and he merely suggested it as a last resort. The conduct of the Company in trying to ride roughshod over the people of Broadstairs, had no doubt stimulated them to say they would not remain under the domination of Mr. Lazarus Hart. But if the Bill, as regarded this site, was not allowed to proceed, he should not ask for a purchase clause. Nothing but a matter which would vitally affect their interests would have led the Council to go to the expense of again appearing before a Parliamentary Committee in opposition to a Bill of the Company.

The CHAIRMAN (after briefly consulting his colleagues) said the Committee would like to hear evidence with regard to the strong objection which was felt by the people of Broadstairs.

Mr. *J. Horell*, Chairman of the Council, said the resolution authorizing the Council to oppose the Bill was carried at a public meeting of ratepayers by a large majority; there being only 18 opponents, who were almost entirely employees of the Company. Since then, the Council had received a petition signed by 286 ratepayers asking them to oppose the Bill if necessary in both Houses of Parliament. Public feeling in Broadstairs was wholly opposed to the site proposed, which, he had no doubt, would ultimately be the centre of the town. There was every indication that the land adjacent to the site would immediately become a good-class residential neighbourhood. The contemplated works would be generally ruinous to the welfare of the town, and destroy its attractions as a health resort. At a recent election for the Town Council, the candidate who supported the Bill was beaten.

Mr. *Byron*, a member of the Council, also gave evidence as to the detrimental effect the construction of the works on the proposed site would have on the town. He was also Chairman of the Parish Council of the district in which the proposed alternative site was situated; and he stated that the Council would have no objection to the works being erected there.

Cross-examined by Mr. BALFOUR BROWNE: The proposed site in Broadstairs was the worst possible from the point of view of the advantage of the town.

The Rev. Mr. *Johnson*, Vicar of St. Peters, Broadstairs, said that the taking of the site proposed for gas-works would cause monstrous injury to Broadstairs. When the decision of the Committee of the House of Commons was made known, there was a feeling of absolute astonishment and indignation among the residents, who thought nobody could have dreamt of placing gas-works in such a position.

Mr. *W. Churchill*, residing at Stonehouse, St. Peters, where he carried on a preparatory school for boys going to Eton, gave confirmatory evidence. As to the proposal to plant trees, he said he knew from experience they would not grow unless they were sheltered.

The CHAIRMAN: I do not think you need call another witness.

The room was then cleared while the Committee deliberated in private. On the readmission of the parties,

The CHAIRMAN said: The Committee have decided that the Bill cannot proceed with the site clause.

Mr. BALFOUR BROWNE stated that under the Bill the Company asked for £40,000 additional capital, and borrowing powers besides. As the site had gone, it would not be necessary for the Company to raise such a large sum. Considerable expense had, however, been incurred in connection with the present works, and they required a large amount of additional capital. It was therefore proposed to cut down the capital sought by one-half. This money could not be spent on anything not really necessary for the supply of gas.

Mr. WEDDERBURN said the question of site having gone from the Bill, the expenditure on new works would also go, because even if the Company were to acquire a new site by agreement they could not, without an Act, use it for the manufacture of gas. As to storage, the Company had already said they could store gas on the existing site. When the Company applied to Parliament would be the proper time to say how much capital they wanted, and what they wanted it for. At present, all the capital they required was, at the outside, £5000.

Mr. BALFOUR BROWNE said he was informed that the Company had already overspent their capital to a considerable extent; and for this purpose, and to extend mains and carry out other improvements, they would need £20,000

Mr. *H. E. Jones* was then called. He said the promoters had overspent their capital by about £5000, and had incurred an outlay on the promotion of the present Bill probably amounting to £2000. Besides this, they needed £4000 or £5000 for the immediate erection of a gasholder; and, further, they would require to spend some £1500 or £2000 a year on mains, services, meters, &c. There could be no objection to the Company having capital powers, because it would all be issued by auction; and it was to the interest of the shareholders not to spend money.

In reply to Mr. WEDDERBURN, witness said he was not prepared to submit himself to cross-examination upon these figures, owing to the suddenness with which the matter had come upon him.

Mr. *E. H. Stevenson* said the present storage capacity was not sufficient; and next winter they would only have storage equal to about three-quarters of a day's supply. A new gasholder, which would cost about £5000, must therefore be provided at once.

Mr. *W. A. Valon*, for the Council, said the works of the Company were sufficient to carry them on for another two or three years. They had two or three beds of retorts which had not yet been used; and they also had 15 per cent. excess storage, which was not an unusual amount by any means. The utmost they required for another year was £5000.

Cross-examined: Beyond this £5000, he would allow £2000 for the costs of the Bill, and £2000 for outstanding matters, with the usual borrowing powers.

The CHAIRMAN said the Committee agreed to the sum of £12,000, which would include the usual borrowing powers of £3000.

Mr. WEDDERBURN said the only other question was as to the standard price, which, though he called no evidence upon it, he asked the Committee to reduce from 4s. 4d. to 3s. 9d., having regard to the actual reduction in the cost of gas. The reduction should apply to all the capital, or, failing that, to all except the £12,000 original capital.

Mr. MOON asked if it was worth while, on a grant of £9000 of new capital, to argue whether the standard price should be altered.

The CHAIRMAN: The Committee would object to altering the standard price.

The clauses were subsequently adjusted in accordance with the decisions of the Committee; and the Bill was then ordered for third reading.

Increased Discount to Gas Consumers at Eccles.—Discussion took place at last Wednesday's meeting of the Eccles Town Council, regarding the proposal of the Salford Gas Committee to increase from 2d. to 4d. per 1000 cubic feet the discount upon gas bills paid within a month, rather than make an actual reduction in the price of gas. It was urged that this was an unbusinesslike method on the part of the Gas Committee, as those who bought gas through prepayment meters would receive no benefit. Several members expressed their satisfaction at receiving the increased abatement; and ultimately the decision of the Committee was accepted.

JOINT PARLIAMENTARY COMMITTEE ON THE LONDON WATER BILL.

(*Lord* BALFOUR OF BURLEIGH, *Chairman.*)

Eighteenth Day—Friday, May 30.

On the resumption of the inquiry this morning,

Mr. BALFOUR BROWNE, on behalf of the London County Council, moved to omit from sub-section 1 of clause 32 the following item to be paid under the Bill by the Water Board to the Metropolitan Water Companies, in addition to a sum equal to the dividend on the capital by way of interest on the purchase money: "Together with, in respect of the reasonable expectations of increasing dividends (if any), such additional sums (if any) as may be agreed on, or in default of agreement as may be determined by arbitration under this Act." He said if this were agreed to by the Committee, there would be a consequential deletion of the words in sub-section 2 making provision for the money to be paid when it had been determined, if such determination had not been made on the proper date. The idea of the clause was that, pending the transfer of the undertakings, the Water Companies should not lose their dividend. But in the words the County Council wished struck out, the Companies were to be entitled to prove before the arbitrator that the dividend would have increased in the year to come. This was grossly unjust, because it was a sliding-scale which worked only one way. If they were entitled to show an increase, surely the Water Board should be at liberty to show that the dividends might have gone down. But this was not the idea of the clause at all. It was to give the Companies, pending the absolute transfer, the same dividend that they had got before.

Mr. PEMBER, for the Companies, denied the contention of the learned Counsel. He said clause 32 was one dealing with income only. Between the time at which the undertakings passed to the Water Board and the time when compensation was actually paid, six months might elapse, during which the Bill proposed that the shareholders should get the same income as they would have done had the Companies remained in existence.

Mr. FITZGERALD thought that the clause as it stood, unaltered either by the amendment proposed by the Companies or by that of the County Council, really did justice.

The CHAIRMAN: It is relatively a small matter. It cannot be for many months. The Committee prefer the clause as it stands in the Bill.

The next amendment proposed by the Water Companies was accepted by the Local Government Board, and agreed to by the Committee—viz., to strike out certain words and insert others to make sub-section 2 read: "The payments under this section shall, until the compensation as aforesaid under this Act is paid or satisfied, be payable by the Water Board at the dates on which the dividend on the ordinary and preference capital would have been distributable by the Company."

Mr. BAGGALLAY moved to add at the end of sub-section 1 the words, "such sum shall be treated by the Companies respectively as profits available for dividend between the shareholders as if this Act had not been passed, and may be distributed or dealt with accordingly."

The amendment was accepted.

Mr. FITZGERALD said it might be necessary to make a drafting amendment to clause 32, and therefore he asked that it might not be formally passed.

The clause was accordingly postponed.

On clause 33 ("Temporary advances"), the following amendment, which had been promised by the Local Government Board to the Companies, was agreed to. It was to insert words (shown in italics) to make the clause read: "The Water Board may obtain advances of such sums of money as they may require for *meeting their obligations and* carrying on their business," &c.

Clauses 33 (as amended), 34, and 35 were agreed to.

On clause 36 ("Existing officers and servants"), Mr. BAGGALLAY announced that the Water Companies had a substantial alteration to propose.

Mr. FITZGERALD said that every endeavour had been made by the Local Government Board, with regard to the officers and servants of the Water Companies, to present an agreed clause to the Committee. The result of several conferences was that they were very near an agreement, and if the clause were postponed it would save a great deal of discussion. Some of the officers and servants of the Companies claimed to be in this position—that they were originally appointed on the understanding, being gentlemen having special knowledge, and being beyond the age when appointments were ordinarily made, that this should be taken into account in their retiring pensions. If that were so, they ought not to be placed in a worse position; but the facts should be proved before the Committee. With regard to Sir William Crookes and Professor Dewar, this was an entirely different matter; and as they were busy men it might be desirable to have their evidence taken now.

Mr. BAGGALLAY said that Mr. Walter Hunter, the Engineering Director of the Grand Junction Company, and Mr. Wilkins, the Secretary of the Lambeth Company, were not able to be present to give evidence, and perhaps it would be better to postpone the clause. He would, however, put Professor Dewar and Sir William Crookes into the box.

Professor *Dewar* was then called, and examined by Mr. BAGGALLAY. He said he had for the last seven years acted in connection with the London Water Companies with regard to the analysis of samples of the water supplied. There was an understanding, but not a written agreement, that Sir William Crookes and himself should be responsible for the management of the department, which was now essential to the proper production of water for the community, and should be absolutely independent as regards its administration—the Companies supplying the means of carrying it on. Having explained the nature and extent of the work, witness said the Local Government Board accepted their reports as authoritative, and they were published in their annual report, which was submitted to Parliament. The chief interest of his colleague and himself, apart from personal matters, was to see the department maintained. There was nothing in the Bill which recognized its importance, after it had been brought, by years of labour, into proper working order. For the purposes of the compensation section, they wished to be deemed officers of the Companies, not only in their own interests, but in that of the department.

The CHAIRMAN asked what was the precise proposal.

Witness: The point is that this department should be recognized as one which would include us as officers.

Mr. BAGGALLAY said the words proposed, which would come into clause 36 as a concluding sub-section, were as follows: "For the purposes of this section, Sir William Crookes, Kt., of 7, Kensington Park Gardens, in the County of London, and James Dewar, of the Royal Institution, Albemarle Street, in the said county, Professor of Chemistry, shall be deemed to be existing officers."

The CHAIRMAN: Really, the work of this department took its origin from the report of the Commission and the recommendations we made ten years ago.

Witness: Yes. It was for that reason I became associated with it.

Sir *William Crookes* was next called, and corroborated the statement of the previous witness.

The CHAIRMAN: I am not sure about the wording of the proposed clause; but I think the Committee would like to recognize the extreme importance of this work, and the necessity for its being carried on, and to have some security in the Bill that this will be done. It is obvious that the apprehension is that the present system may be superseded by that of the London County Council. If this were done arbitrarily, I consider a certain injustice would be caused by the sudden termination of this work. With that indication of opinion, I think you can come to an agreement in the matter.

The matter was left in abeyance.

A proposed addition to the clause, made by the Water Companies, to deal with the case of the officers of Companies having special understandings with their employers, was next proceeded with.

Mr. *W. B. Bryan*, Engineer of the East London Water Company, said he entered their service at 34 years of age, and had been with them for twenty years. There was no special arrangement made as to pension, but the Engineer he succeeded was receiving one of £1000 a year. It was the practice of the Company to grant pensions not only to their officers, but also to engine drivers, labourers, and others.

Mr. *F. Parkes*, Engineer of the Lambeth Water Company, said he was appointed in 1880, being then 32, and was made Engineer-in-Chief in 1890. He gave similar evidence to that submitted by the last witness with regard to his position.

The CHAIRMAN: Are there any agreements, or do you rely upon the implicit faith of your employers?

Witness: We rely upon the benevolent action of the Company, but the Civil Service scale has always been adopted as a minimum.

Mr. THESIGER said the London County Council did not take up any hostile attitude in this matter.

Mr. FITZGERALD said the Local Government Board thought the Committee should be put in possession of the facts where specific arrangements were alleged. Certain officers claimed that they were entitled, in the computation of their pensions, to receive an extra allowance beyond the actual term of their service.

Mr. PEMBER: As I understand it, the Local Government Board sent us a clause to which they were willing to subscribe, and the Water Companies are satisfied with it.

Mr. FITZGERALD: I said we were nearly agreed. This is the clause we submitted to Mr. Pember:—

> In computing the time of service of any existing officer or existing servant for the purpose of any annual allowance which may be awarded him by the Water Board under the provisions of the Superannuation Act, 1866, as applied by this Act, the period during which he has been in the service of a Metropolitan Water Company shall be included; and in case of the following officers—viz., the Secretary and Engineer of the East London Water-Works Company, the Secretary and Engineer of the Lambeth Water-Works Company, and the Engineer of the Grand Junction Water-Works Company—who were appointed to their office as specially qualified persons at an age exceeding that at which public service ordinarily begins, there should be added to the number of years during which he has actually served such a number of years, not exceeding twenty, as the Water Board, or, on appeal, the Treasury may think just.

Mr. PEMBER: I am content with that.

The CHAIRMAN: It comes to this, that, under such a clause, the individual circumstances must be taken into account in the future at the time of retirement. What we wish to secure is that the same fair consideration shall be shown, and the same confidence given, to the officer in the future as he has had in the past.

Mr. THESIGER said he hoped the Committee would not formally pass the clause at once.

The CHAIRMAN: I do not think there is the least likelihood of the Committee passing from the general lines I have given.

Mr. THESIGER said they were lines with which the London County Council would not differ at all. He only made the application in order to protect their position.

Clause 36 was postponed, and clauses 37, 38, 39, and 40 were passed without opposition. This brought to a close the consideration of the clauses of the Bill as originally drafted.

The proposed new clauses were then proceeded with.

New Clause A, proposed by the Essex County Council for their protection, was thrown out, as it was not within the notice.

New Clause B, by the Hertfordshire County Council, dealing with the urban districts of Cheshunt and Ware, was not moved.

New Clauses C, D, and E, by the Middlesex County Council, for the protection of water consumers in Middlesex, were postponed.

On new Clause F, by the Croydon Corporation—proposing that any officer of the boroughs of Croydon and Richmond and the Urban District Councils of Cheshunt, Enfield, Tottenham, and Ware should respectively have free access to the works of any Metropolitan Water Company supplying water within their districts, for the purpose of inspecting their works, books, accounts, and documents—there was no appearance; and it was struck out.

New Clause G, by the Colne Valley Water Company, setting forth

that," notwithstanding anything in this Act, it shall not be lawful for the Water Board, without the authority of Parliament, to supply water in that part of the parish of Hendon which, under the Colne Valley Water Act, 1873, is within the limits of supply of the Colne Valley Water Company," was accepted by the Local Government Board and passed by the Committee.

A further clause, proposing that it should not be lawful for the Water Board, without the authority of Parliament, to supply within the limits of the Colne Valley Water Company, was rejected.

New Clause H, proposed by the South-West Suburban Water Company, was agreed to by the Local Government Board, as follows:—

Nothing contained in, or done under, this Act shall prejudice or affect any agreement between the South-West Suburban Water Company and any Metropolitan Water Company or any local authority or person, made prior to the passing of this Act, for a supply of water within the statutory district of the South-West Suburban Water Company, or shall authorize the Water Board to supply water within the limits of supply of the South-West Suburban Water Company as defined by section 4 of the South-West Suburban Water Act, 1883, except in pursuance of any such agreement.

The Committee passed the clause.

New Clause I, another agreed clause, was proposed by the Sutton District Water Company. It provided that the Water Board should not supply water within the limits of that Company, except so much as was on March 25, 1902, served by the Lambeth Water-Works Company; and it was agreed to.

New Clause J had already been rejected by the Committee on the Kent Company's case.

On new Clause K,

Mr. FITZGERALD stated that this also was an agreed clause, and was consequent upon the discussion which had taken place on the matter. It was proposed by the Barnet District Gas and Water Company, and ran as follows:—

(1) The Water Board shall not be entitled to supply water within so much of the urban district of Enfield as is comprised within the statutory limits of the Barnet District Gas and Water Company for the supply of water; but this restriction shall apply only if and so long as that Company are able and willing to supply water proper and sufficient for all reasonable purposes for which it is required by the Enfield Urban District Council and the provisions as to the settlement of differences under section 52 of the Public Health Act, 1875, shall apply.

(2) The provisions of this Act shall not empower the Water Board to supply water (unless with the consent of the Barnet District Gas and Water Company) within any part of the statutory limits of that Company for the supply of water in which a Metropolitan Water Company were not authorized to supply water, except to such premises as at the appointed day may be actually supplied by the New River Company.

The clause was passed.

New Clause L, by the New River Company, was withdrawn, as another would be substituted for it at a later stage.

New Clause M, by the same Company, proposed in its first sub-section that the Water Board should repay to the New River, West Middlesex, and Grand Junction Companies respectively all such sums as these Companies had, prior to the date on which water should have been first obtained by them by means of the works authorized by the Staines Reservoirs Acts, 1896 and 1898, paid pursuant to the provisions of those Acts.

Mr. FITZGERALD brought up a clause which left the whole matter to the arbitrator.

Mr. FREEMAN, on behalf of the London County Council, agreed with the clause proposed by the Local Government Board.

After some discussion, the Committee expressed their satisfaction with the clause as amended by the promoters.

Mr. BAGGALLAY then brought forward the second sub-section of new Clause M., as follows:—

As from the appointed day, the Water Board shall take over, assume, and be subject to all the duties, obligations, debts (whether to debenture stockholders or others), and liabilities of the said three Companies and the Staines Reservoirs Joint Committee under the said Acts, and shall effectually indemnify and save harmless the said three Companies and the Joint Committee respectively against any actions, claims, damages, demands, or proceedings in respect of any of such duties, obligations, debts, or liabilities as aforesaid.

Mr. FITZGERALD said it was clear that the Companies were relieved of all liability. The whole matter had been dealt with by a previous clause.

Mr. BAGGALLAY denied this.

The CHAIRMAN: The Committee think that should be made clear. There is a feeling that the apprehensions of Mr. Baggallay might be right.

Mr. FITZGERALD said if it were transferred to the New River Company's special clause, he would agree to it.

This course was agreed to.

New Clause N was brought up by Mr. RAY LANKESTER on behalf of the South Essex Water-Works Company, as follows:—

Notwithstanding anything in this Act, it shall not be lawful for the Water Board to extend their supply of water, whether in bulk or otherwise, to or within so much of the Romford rural district, the Ilford urban district, or the Barking urban district as is comprised within the statutory limits of the South Essex Water-Works Company. But this restriction shall apply only and if so long as the Company are able and willing to supply water proper and sufficient for all reasonable purposes for which it is required by the Romford Rural District Council and the Ilford and Barking Urban District Councils; and the provisions relating to the settlement of differences under section 52 of the Public Health Act, 1875, shall apply.

Mr. FITZGERALD said the Local Government Board would agree to this with regard to the Romford rural district, but not with reference to the Ilford and Barking urban districts.

The Committee concurred, and the clause as altered was passed.

New Clause O, for the protection of the Lea Conservancy Board, was postponed till the following Tuesday.

Mr. FITZGERALD brought up a clause to carry out the decision of the Committee with regard to the Tottenham and Enfield District Councils. He stated that two further clauses were proposed by Tottenham and Enfield respectively, embodying their view of what the decision of the Committee was, or ought to have been. The real point in dispute between the promoters and the urban districts was how the consideration was to be fixed. The Local Government Board (by sub-section 2) left it to arbitration; while the urban districts—or at least, Enfield—wanted to have special provisions.

After some discussion,

The CHAIRMAN said the Committee could not agree to the proposed sub-section as against that put forward by the Local Government Board.

Mr. LITTLER then introduced the clause proposed by Enfield.

The CHAIRMAN: To my mind, the sum paid for the transfer must be determined by arbitration.

This was agreed to by the Committee.

On sub-section 5 of the proposed clause,

Mr. LITTLER moved an amendment to add two words (those in italics) as follows: "The Water Board shall, as from the appointed day, supply water *in bulk* to such parts of the urban districts of Tottenham and Enfield as are immediately before that date supplied by the Councils thereof," &c. If the Committee did not see fit to make the addition, he asked that the sub-section should be struck out.

Mr. FITZGERALD said the object of the insertion of the sub-section was to make the powers of the New River Company apply throughout the whole of their district. The District Councils were supplying part of that area, not under the New River Company's powers, but under those of the Public Health Act.

In regard to the sub-section dealing with payment,

The CHAIRMAN said the Councils of Tottenham and Enfield must come in on the terms proposed by the Local Government Board, or stand out altogether. The decision of the Committee with regard to sub-section 5 would be given on the following Tuesday.

Nineteenth Day—Tuesday, June 3.

On new Clause P, sub-section 5, on which the Committee were to give their decision this morning,

Mr. FITZGERALD stated that the Tottenham Urban District Council were now satisfied with the sub-section as it stood. Enfield, however, wished an alteration to be made. Sub-section 5 would therefore remain, cutting out the reference to Enfield, and a special sub-section (6) would be inserted, with the approval of the Committee.

Mr. HUTCHINSON stated that Enfield accepted the new sub-section; and it was agreed to.

On new Clause O,

Mr. HUTCHINSON brought up a clause for the protection of the Lea Conservancy Board, as follows:—

Whereas under the provisions of the River Lea Water Act, 1855, and the Lea Conservancy Acts, 1868 and 1900, a sum of £8000 is payable annually by the New River and East London Water-Works Companies to the Lea Board, and such annual payment forms part of the security for the Lea Conservancy perpetual debenture stock, and it is expedient to provide for the redemption of such annual payment, be it enacted: (1) Within two years from the appointed day, the Water Board shall issue to the Lea Board such an amount of water stock as is sufficient to produce the sum of £8000 per annum.

The other sub-sections were consequential upon the above, and were not read by Counsel, who explained the various Acts under which the payment was made to the Board.

Mr. FITZGERALD said the only question was whether or not this particular liability of the Water Companies ought to be capitalized. He contended that there was no reason for any differential treatment in regard to the liability.

The CHAIRMAN: The Committee will not accept this clause.

On new Clause C,

Mr. BAGGALLAY brought up a clause for the protection of water consumers in Middlesex. The first sub-section was for the purpose of ensuring to them as good a supply as they are at present receiving; the second gave them the first drink of their own water; and the third provided that the charge should not be increased by reason of the fact that in the future the Water Board might have to go further afield for their supply, seeing that Middlesex had only sufficient for itself.

The CHAIRMAN intimated that the matter was not germane to the Bill, and did not come within its purview; and without going into the merits of the question at all, he thought on that ground the clause had better be withdrawn. It would be better for Middlesex, and also for Kent and Essex, to reserve the question to be raised before Parliament at the proper time.

Mr. BAGGALLAY asked if the Committee would be willing to insert such a clause as was suggested on behalf of the Kent authorities—that nothing in the Act itself, or done under its powers, should in any way prejudice any application which might within five years after the passing of the Act be made to Parliament.

After some discussion, it was agreed to hear Mr. Wedderburn upon the proposed Kent clause. It provided that nothing should prejudice the Kent authorities in asking Parliament, within five years, for the constitution of a Joint Board "for the supply of water throughout such portion of the Administrative County of Kent as is within the limits of supply, and for the purchase by such Joint Board of so much of any undertaking to be acquired by the Water Board under this Act as is within the said portion of the said county."

Mr. WEDDERBURN said he had understood from the remarks made by the Chairman on the 6th of May, that the Committee would probably be in favour of the clause now brought up. He urged that it was necessary, in order to prevent its being argued hereafter that the Committee had decided against Kent having a separate Water Board. It would not be competent for them hereafter to refer to the present proceedings in order to show that the decision was merely against going into the merits of the proposal on a Transfer Bill.

The CHAIRMAN said he disliked, as a matter of procedure, to insert a saving clause when there was nothing in the Act which ought to prejudice parties without such saving clause. He thought the better way of dealing with the matter was to declare from the Chair, as the unanimous statement of the Committee, that they had not gone into the merits of that particular proposal, because they ruled it beyond the purview of the Bill. No one could then say that either side was prejudiced in any subsequent inquiry.

Mr. WEDDERBURN said that if, in addition to what the Chairman

had stated, Mr. Fitzgerald would give an undertaking that no argument should be used against the Kent authorities in subsequent proceedings, he thought he ought to be content.

Mr. FITZGERALD said he had already stated that all the applications of Kent, Essex, Ilford, Barking, &c., had been ruled out by the Committee because they were not within the purview of the Bill, and without expressing any opinion on their merits.

Mr. WEDDERBURN asked if he was to understand that no argument would be urged against Kent by reason of what had occurred in the present proceedings.

Mr. FITZGERALD: That follows, certainly.

Mr. WEDDERBURN: Then I am content, if that undertaking has the sanction of the Committee.

The CHAIRMAN: The Committee are unanimously in favour of that method of settling it.

Mr. BAGGALLAY accordingly withdrew the clause proposed by Middlesex; and the same course was pursued in the case of Essex.

Mr. RAY LANKESTER asked that East Ham might also be included with regard to the clause which proposed that the East Ham Urban District Council might be enabled to take over part of the undertaking within their district, and to supply water within their district themselves.

This was granted.

New Clause Q was a proposal by the Westminster Corporation to the following effect: "The Water Board shall exercise all the rights and powers of charging water-rates transferred from the Metropolitan Water Companies to the Water Board by this Act before issuing any precepts under the provisions of section 11 of this Act."

The matter has already been discussed on clause 11 (*ante*, p. 1362).

Mr. FITZGERALD said there was a difference of opinion between the Westminster Corporation and the Local Government Board as to the proper wording. It had better stand over until clause 11, which had been postponed, was considered.

This course was agreed to.

New Clause R, proposed by the Incorporated Law Society in lieu of sub-section 3 of clause 19, was accepted by the Local Government Board, and passed by the Committee. It provided that the Clerk of the Water Board, or any officer or member thereof, acting under a general or special resolution, might authorize the institution and carrying on, or the defence, of any proceeding which the Board were empowered to institute, carry on, or defend.

New Clause S was introduced by Mr. RAY LANKESTER on behalf of the Hertfordshire County Council. Sub-section 1 provided that the quantity of water to be supplied in bulk, under the provisions of the Act, to the Council of an urban or rural district in Hertfordshire should not be determined by agreement or arbitration, but should be such an amount as the Council might require, so that it did not exceed a certain quantity. Sub-section 2 included the urban district of Hoddesdon within the terms of the section.

The CHAIRMAN said the Committee would insert the clause.

Mr. THESIGER brought up the following new Clause U: "This Act, and the transfer of the undertakings under this Act, shall not be deemed a transfer for the purpose of stamp duty."

The CHAIRMAN said he would take advice from the authorities of the House on this matter. After an interval, he announced that there was no precedent for a Committee inserting such a clause as the one proposed; and the Committee did not propose to make one.

A new Clause V, as to payments by the Water Board, was proposed by the London County Council; and the Local Government Board left the matter in the hands of the Committee.

Mr. THESIGER stated that the terms of the clause applied to the London County Council and the Metropolitan Boroughs, and it was thought desirable that the Water Board should be under the same rules with regard to its financial arrangements, as no exception could be taken to them.

The Committee accepted the clause.

On new Clause Y,

Mr. BAGGALLAY proposed, on behalf of the Water Companies, the following clause:—

> The Water Board shall pay to the Directors of the Metropolitan Water Companies in office on the appointed day compensation for the loss sustained by them by reason of the abolition of their office. Any question arising under this section shall be settled by an arbitrator to be appointed by the Local Government Board.

Counsel pointed out that it was stated by Lord Llandaff's Commission that "some compensation to Directors will probably be thought necessary by Parliament." Practically, the directorships were life appointments. They had been paid their remuneration out of revenue—the Companies' undertakings having suffered in loss of revenue to this extent; and therefore, as the price would be based on revenue, no injustice would be done in compensating the Directors.

Mr. *E. Boulnois*, M.P., Chairman of the West Middlesex Water Company, was then called. In answer to Mr. BAGGALLAY, he stated that he had held this position since 1896, and had also been Chairman of the Staines Reservoirs Joint Committee. He had been a Director of the Company since 1884. The principle of compensation to them for loss of office had been proposed in some of the earlier Bills dealing with the London Water Supply. It was done in the London County Council Bill of 1895. The basis of purchase was the net income after deducting all outgoings, which included Directors' fees. Therefore, if no compensation were paid to the Directors, the purchasing body would obtain the undertakings at a lower price. He thought the Directors were entitled, in fairness, to some compensation for being expropriated.

In cross-examination by Mr. FREEMAN, for the London County Council, witness said he could not adduce an instance of any Act which gave compensation to the directors of a water company which had been tansferred to a corporation. The majority of water undertakings were transferred by agreement; and in those cases such compensation had been arranged for. He could not suggest any differentiation between a London Water Company and that of a provincial town in this regard.

Cross-examined by Mr. FITZGERALD as to the form of the clause, witness agreed that it would not be fair to pay compensation to the Directors in office "on the appointed day," if appointed after the commencement of the Bill. Under the clause, there might be arbitration in respect of the compensation for every single Director of every Company. He thought that should be avoided.

Colonel *Lockwood*, M.P., Chairman of the East London Water Company, gave similar evidence. He showed, as the previous witness had done, that there was a great deal of work done by the Directors of the various Companies.

Mr. FREEMAN pointed out that everybody agreed that the clause was an entirely new precedent. He was not aware that the Bill was exceptional so far as this matter was concerned.

Mr. FITZGERALD said, as far as the principle of compensation was concerned, the Local Government Board desired to leave the matter entirely in the hands of the Committee. With regard to the form of the clause, compensation should be given to Directors in office at the date of the publication of the notice; and provision should be made against separate arbitrations for each Director. He proposed that this might be done by allocating a sum to each Company.

After a deliberation by the Committee in private,

The CHAIRMAN said: The Committee accept in principle the compensation to the Directors who were in office at the date of the notices for the Bill; the amount of compensation to be awarded by arbitration to each Company, and the amount given to each Company to be distributed at sight of the Board of each Company.

The following clause (Z) was proposed by the Sunbury Urban District Council and the Association for Promoting the Equitable Rating of Reservoirs:—

> For the purposes of all rates leviable upon the Water Board in respect of any reservoirs, filter-beds, aqueducts, and works belonging to them, the Water Board shall be assessed on the full annual value thereof.

The CHAIRMAN expressed sympathy with the object of this amendment, but said this was not the time and place to deal with it, and therefore the Committee rejected it.

Mr. BAGGALLAY then moved new Clause L, which contained special provisions for the New River Company, owing to the exceptional circumstances of their case.

Mr. FREEMAN said the London County Council did not object to the clause, except with regard to the portions relating to the payment by the Water Board of the costs of the distribution or transfer of water stock. He contended that all that could be justly asked was covered by clause 18, sub section 9: "The Court may make such allowance as they think just for covering any expenses which have been or are likely to be incurred in consequence of the passing of this Act, and which ought, in the opinion of the Court, to be borne by the Water Board."

Mr. FITZGERALD said the Local Government Board took the same view of the matter as that expressed by Mr. Freeman. If necessary, the following words might be added to sub-section 9 of clause 18: "by any Metropolitan Water Company or the shareholders or stockholders therein."

The CHAIRMAN said the Committee would be willing to insert the words suggested, but would not accept the compulsory obligations laid down in the clause as submitted.

After deliberating in private, the Committee passed the remainder of the clause.

Some discussion then took place as to procedure; and it was agreed to take clause 1 and the third schedule, dealing with representation on the Water Board, at the next sitting, fixed for June 10 (to-day).

Increase in Price at Nelson.—At the last meeting of the Nelson Corporation Gas Committee, it was reported that the profits for the year, instead of being £4500, as estimated, had only amounted to £680. In consequence, it was decided to raise the price of gas by 3d. per 1000 cubic feet (from 2s. 9d. to 3s.), with the existing discount of 3d. if accounts are paid within fourteen days.

Colchester Water Supply.—The income of the Colchester Water-Works for the past year shows an increase of £560 over the previous twelve months. After providing £206 for repairs and painting of the water tank and tower, placing the usual amount to the sinking fund, paying interest on loans, and deducting the working expenses, there is a balance on revenue account for the year of £2140. Of this sum, £1500 has been contributed to the relief of the rates, making the total amount allocated by the Water Department for this purpose up to date £6000.

Grand Junction Water-Works Company.—At the half-yearly meeting of this Company to-morrow, the Directors will report an increase of 946 in the number of the supplies in the six months ending the 31st of March last, making the total 69,944. The amount available for distribution is £83,082; and the Directors recommend dividends at the rates of 8, 7½, and 7 per cent. per annum. After payment of these, there will remain to be carried forward £32,967, compared with £29,793 at the beginning of the half year. The Staines reservoirs, in which the Company have a third share, are now approaching completion. The total amount paid out of revenue in respect of the Company's proportion of interest on capital and management charges up to March 31, 1902, is £29,500.

Milton (Sittingbourne) Water Supply.—A Local Government Board inquiry has recently been held into an application by the Milton Urban District Council for sanction to borrow £12,000 for water-works purposes. The site of the suggested works is at Highsted, about 2 miles from Milton. The wells (two in number) will be sunk in the chalk at a level of 100 feet above the sea, and the water will be forced up to a large reservoir on an adjacent hill, from which it will be conveyed by mains to the Milton boundary at Chalkwell, and distributed. It is proposed to instal duplicate Giesel oil-engines of 30-horse power each; and the estimated daily yield is 176,000 gallons, which would give 25 gallons per head. The estimated working expenses are £200 a year. Several large ratepayers opposed the scheme; and the Sittingbourne Urban District Council made an unsuccessful attempt to get the inquiry adjourned pending the result of negotiations for the amalgamation of the two districts.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Tuesday, June 3.

(*Before Mr. Justice* LAWRANCE *and a Special Jury.*)

Ilford Gas Company v. Ilford Urban District Council—Damage to Gas-Mains.

This was a claim by the plaintiffs for compensation for damage and loss occasioned to their mains through the alleged negligence of the defendants and their servants in constructing a sewer. The defendants denied any negligence on their part, and said that if anyone was liable it was the Contractor, whom they brought in as a third party.

Mr. MACASKIE, K.C., Mr. LUSH, K.C., and Mr. S. MAYER appeared for the plaintiffs; Mr. C. A. RUSSELL, K.C., and Mr. W. WHATELEY for the District Council; and Mr. DUKE, K.C., and Mr. MACKENZIE represented Mr. John Jackson, the third party to the action.

Mr. MACASKIE, in opening the case, said the plaintiffs had been established for a good many years under the authority of their Acts of Parliament, by virtue of which they were entitled to lay down mains for supplying the inhabitants of Ilford with gas. At various times they had laid mains in a very broad thoroughfare called Green Lane; and from time to time these had to be extended in consequence of the growth of the neighbourhood. The principal pipe was laid 2 ft. 6 in. below the surface of the road. Everything went on well until the early part of last year, when the defendants decided to make a sewer along Green Lane to meet the wants of the district; and they entered into a contract with Mr. John Jackson to do the work. He agreed to carry it out under the instructions of the Engineer of the District Council; and, among other things, he undertook to indemnify the Council in respect of any injury done to the property of other persons. He further agreed to support the gas-mains, remove all timbering, and take every precaution against injuring other people's property. He began the work by constructing the sewer on the side of the road opposite to that which contained the main; but after going on for 200 or 300 yards, he for some reason or another crossed over, and the course he then took was such as he (the learned Counsel) thought the Jury would be of opinion it was impossible to justify. His men dug a trench under, and by the side of, the main to a depth of 10 or 12 feet, the effect of which was to leave the main more or less in the air. To counteract this, it was necessary to put in some sort of support, and the men put in some bricks; but, from the result, they would appear to have been inadequate. Having made their sewer, there was the business of filling up the road again; and the Jury would hear that the way in which this was done was little short of scandalous. This was in July, 1901. Towards the end of the month, the police authorities notified to the plaintiffs that there was a serious escape of gas in the roadway; and they then had to find out where it was. After some days, having opened 90 feet of road, they discovered the cause of the mischief. They found that the main had been undermined by the defendant's operations, and that an attempt had been made to support it on 9-inch brick piers. In such a fashion had this perfectly unauthorized interference with the plaintiffs' property been effected, however, that there was a fracture in the main about ¾-inch in width. So far from the main being level, it more nearly resembled a switchback. The escape of gas had been going on, as far as they could estimate, for about a fortnight. The damage was repaired at plaintiffs' expense. The next thing that happened was that other portions of the main were discovered to be fractured; and they were repaired in September. The Jury would not be troubled much with what took place in that month, because the expense was comparatively small. The next thing that happened was that on the 1st of November reports were received of an escape of gas, which again entailed further investigation, and the taking up of the main, with the result that plaintiffs found three more fractures and considerable leaks. They discovered that, contrary to the ordinary practice, the Contractor had left in the timbering, which was pressing down the main and damaging it. Plaintiffs were alarmed at this state of things, and had the main inspected throughout the whole 1500 yards, at many points, and they found it was uneven and deflected as much as 10½ inches in some places, with the result that there were fractures and consequent leakage of gas. After some correspondence, the plaintiffs brought the present action; and they now asked for damages to recompense them for the actual expense and loss which had been entailed on them in consequence, as they maintained, of the Contractor's negligence. In the opinion of gas engineers, it would be necessary to entirely relay the main; and if this were done, plaintiffs would be put to considerable expense.

Justice LAWRANCE remarked that, as he understood the case, a good deal would turn on the effect of the indemnity given to the District Council by the Contractor.

After some discussion as to the position between the defendants and the Contractor, witnesses were called.

Mr *J. H. Brown*, the Engineer and Manager of the plaintiff Company, gave evidence as to the various fractures, and the estimated cost of the gas lost by leakage. He said that, in his opinion, it would be necessary to relay the whole main at a cost of about £630, otherwise there would be continual subsidences and frequent breakages and escapes of gas. Of this amount, £250 would be needed for properly filling up the 12-feet trench.

Wednesday, June 4.

On the resumption of the proceedings to-day,

Mr. *E. H. Stevenson* gave evidence. He said he had made a careful examination of the main, and found that it was in very good condition. There was nothing suggesting corrosion or rust, as the soil in which it was laid was not such as would cause the pipe to deteriorate rapidly. The edges of the fractures were perfectly clean, and the main had the appearance of having been disturbed. The only possible cause for its deflection was, in his opinion, the operations which had been carried on by the Contractor for the sewer. If the trench had been properly filled in and the earth rammed, such an extensive deflection could not have occurred. At every place where he inspected the main there was a settlement. Having regard to the condition in which he found the pipe, it ought certainly, in his opinion, to be relaid. He should never advise anyone to leave the main in its present condition, as it was probable that there would be more fractures and continual interruptions in the supply of gas. The better way would be to lay an entirely new main in undisturbed ground, and not touch the old main, except to cut it off at the ends and junctions. He estimated that the expense of this would be about £361. The cost of taking up the old main and relaying it would be much more than putting in a new pipe.

In cross-examination, witness admitted that when he made the inspection and prepared his estimates, he knew it was for the purposes of the action. The road in question was an old country road which had been made up from time to time; and even now, on the south side of the road, there was a very indefinite boundary, and no footpath. This explained the apparent irregularity in the line of the main. He found the depth of the pipe varied from 1 ft. 4 in. to 3 feet. The former depth was where the main was deflected 10½ inches, and the road there had been cut down 8 or 9 inches since the main was laid. There was practically no extra cost in digging down 1 ft. 6 in. and 2 ft. 6 in., as the greater portion of the expense was incurred in making the road good afterwards. The main was probably laid originally at a uniform depth of 2 ft. to 2 ft. 6 in., as was evident from the fact that the boxes of certain lamp-posts which had not been moved were now 8 or 9 inches above the level of the roadway.

Mr. *John Clark*, the Engineer and Manager of the West Ham Gas Company, said that, with Mr. Brown and Mr. Stevenson, he examined about half-a-dozen openings in the trench. He agreed with Mr. Stevenson as to the condition of the main and the general measurements. The damage was done by the falling in of the ground above the sewer. The trench was filled up with soft sandy soil, more like mud than anything else, and it had sunk sufficiently to take the main down 15 or 16 inches. He saw a wooden strut pressing on part of the main. The effect of leaving it in this way would be that the pipe was supported at that point, but would sink where there was no support. Even if no fracture was caused, the flow of gas would be stopped by the accumulation of water, and it would be necessary to put it right. It must tend either to fracture or to the drawing of the joint, and gas would escape in either case. He should advise the laying of a new main on the opposite side of the road, where the ground had not been disturbed. He would not touch the old main. It would be much cheaper, and it would make a better job of it. He thought the cost would be about £370. He did not think it was a reasonable thing to dig a 12-feet trench under a gas-main.

In cross-examination, witness said he had had no practical experience in constructing sewers; but he had had a good deal to do with preparing ground for the support of gas-mains. He attributed the damage both to the soft nature of the soil and to the want of hard ramming in the work done.

Mr. *W. Whiteley*, District Surveyor of the Essex County Council, said he lived about 500 yards from where the new sewer was made, and he used to notice from time to time the work done. On July 18, he saw there was not sufficient stone put on the top of the sewer, and he wrote to Mr. Shaw, the Engineer and Surveyor of the District Council, on the matter, saying the road was not half rammed.

Cross-examined: He believed Mr. Jackson put in the sewer first, and then the Gas Company opened the road. He charged the damage done to both parties. In February there was a subsidence, which was due to both the sewer and the gas work. He could not say it would have been all right if the Gas Company had rammed the ground tight. His complaint only referred to the surface.

Re-examined: He complained both to Mr. Jackson and to the District Council, but not to the Gas Company, from July to January. He attributed one of the subsidences to bad ramming, and this was where the Company had never been. With regard to bad ramming, he thought the Company and Jackson were both alike.

Alfred Williams, valve-man in the employ of the West Ham Gas Company, said part of his duty was to record the weather at midday. The records for the following days in July were: 25th, rain; 26th, dull; 27th, showery; and 28th, fine.

Mr. MACASKIE said it would be remembered that one of the defendants' pleas was bad weather.

Mr. *W. J. Summer*, the plaintiffs' district inspector of mains, said that on the 29th of July he sought for an escape at No. 47, Camden Road, and eventually found a main in the road broken in two places, with the gas escaping. He should think the level of the main had been moved 12 inches. He subsequently found another escape in the mains in October, which he described. They opened about 18 holes in Green Lane for inspection—the general character of the mains where they opened being very uneven. In his opinion, the main could not be properly repaired; it required relaying.

Cross-examined: He did not think he opened many more holes than 18; and he admitted that he closed some of them before the inspection. There were a few in which damage did not appear, and he closed these up.

James Radley, foreman in the service of the plaintiffs, said he superintended the repair of the damage in question, and he found the filling-in of the trench very bad. In some places the main had dropped about a foot.

Mr. *J. H. Brown* was here recalled and cross-examined by Mr. WHATELEY. He said the fracture in the main allowed the gas to escape freely. There was only a few inches of earth above the fracture, and this would, of course, reduce the quantity of gas escaping by about 100 cubic feet per hour per leakage, which would be about 5 per cent. difference in the estimated amount. The pressure at the mains was 25-10ths on the leading main; and the first break was 250 yards away. If the pipe was open to the air 250 yards away from the main where the pressure was 25-10ths, the loss per hour would be 3317 cubic feet. The loss he estimated would be about 6000 cubic feet per hour, and the cost to manufacture 1s. 10½d. per 1000 feet.

Mr. WHATELEY: How do you value that loss, considering no allowance has been made for reduced pressure caused by escaping gas?

Witness: I have allowed for that, and have reduced the pressure to 10-10ths from 25-10ths; but there were three breaks in the pipes, and that makes our claim of 4000 cubic feet per hour a low one. We had an equal pressure each way on the feeding mains.

In answer to Mr. LUSH, witness said the cost of relaying the main, which he estimated at about £600, was based on laying it in the disturbed portion of the road. If the main was laid anew in virgin soil on the best conditions, it would cost from £380 to £400.

This closed the case for the plaintiffs.

Mr. RUSSELL said that the defendants were not in the habit of resisting proper claims. They were not personally interested in the result of the action, because if they were found liable the loss would fall on the Contractor; but they did not think it right to allow such a demand as this to pass without thoroughly testing it. Being compelled to make the sewer, they gave the matter to the Contractor, who they thought would carry it out in the best way. There was no doubt that he was an independent person, and did not act as the defendants' servant; and this being so, he should submit that the plaintiffs were in the position of having sued the wrong persons. But, to settle the question definitely, it was necessary to go into figures. The gas-mains had been laid in a most extraordinary manner, and it was very hard that the defendants should be charged with the results of things which were not due to their own fault, but to the position of the mains, which made it impossible for the defendants to lay out the sewer scheme so as to avoid them As to negligence, there was none. The only suggestion was that there was improper or insufficient ramming of the earth on the sewer work; but this was entirely a matter for the Contractor. As to the damage, he submitted that the claim was one which should never have been made. To pile it up as the plaintiffs had done was monstrous. They claimed a leakage of 4000 cubic feet of gas per hour for 14 days of 24 hours each; and he regretted that such an unjustifiable attempt should have been made to rob the ratepayers, for which there was no foundation. There were also claims for new mains, &c., which were anything but creditable or proper. He submitted that the utmost that could be allowed on this point was £4 19s. 5d. for the mending of the leakage, with a very small amount for the loss of the gas which escaped from the early morning of July 29, when it was first noticed, till the turning off of the gas. This, again, ought not to be charged at 3s. 6d. per 1000 cubic feet, but at what it cost—viz., 1s. 10½d.; while the suggestion that the gas-main for 1500 yards was to be relaid anew, at the expense of the Ilford ratepayers or of the Contractor, was one of the coolest suggestions he had ever heard.

Mr. *G. M. Taylor* said for 20 years he had been engaged in constructing water and drainage schemes. His firm prepared the one in question, and Mr. Jackson took part of it for about £11,000. The system adopted was to lay it in straight lines from manhole to manhole; but he admitted so much attention would not be paid to the filling up and ramming in the excavations as to the other part of the work. Precisely the same method was adopted in Ash Grove; and no damage was done there. He did not see any evidence that the gas-mains had moved at all, except where there was an actual break. He saw no necessity for relaying the main, as he was strongly of opinion that they had not damaged it in the least, except at the actual point of crossing. He was of opinion that every reasonable precaution was taken, and that the trenches were properly rammed.

Cross examined by Mr. LUSH, witness said he only saw a small portion of the ramming down, but it was the duty of Mr. Bond, the inspector, to see that it was done, while he was on that particular work; but when he was away the work would be left to the Contractor's foreman. He admitted that he could have made the sewer on the other side of the road, so as to avoid the gas-pipes; but the difficulties of traffic prevented this being done. With the exception of the breaks near Camden Road, he asserted that they had not damaged the gas-mains one particle. Where a road was not well filled in, any settlement would be vertical and not horizontal; and if a main was more than a foot away, there would be no effect on it by settlement.

Mr. *W. A. Valon* said he had examined the gas-mains in Green Lane; and outside 280 feet, where the fractures had been, he saw no necessity for relaying. With regard to the quantity of gas which had escaped, he was of opinion that if the pressure at the trunk main was 25-10ths, this would be reduced by every pipe it supplied, and 500 yards away no more than 2300 cubic feet per hour could escape. When the leakage was first discovered, the pipe was at once tied up, and that then the loss would be very small.

Cross-examined: The escape of gas would most certainly be retarded by earth which was around it. He understood the main was supplied from both ends; but he did not know this till he heard it stated in evidence. No matter how well a trench had been rammed, there was always a certain subsidence—how much, it was impossible to say, unless they knew exactly the character of the soil. The usual condition in contracts was that the contractors should keep the road up for six months after filling in.

Thursday, June 5.

When the case was resumed this morning,

Mr. *H. Shaw*, Surveyor to the District Council, said it was untrue to say that the surface of the road had been lowered 8 inches.

Mr. *R. G. Hetherington* said he was Resident Engineer on the contract taken by Mr. Jackson, and regularly supervised the operations; but as his round was 14 miles, he could not constantly watch the work of every gang. He saw nothing wrong in the filling or ramming of the trench when he was present; and the usual and proper precautions were taken to protect the main. What had happened since led him to the belief that one part of the trench could not have been properly filled up.

In cross examination, he admitted that, on the 17th of July, Mr. Whiteley complained to him that the ramming was badly done; and he then spoke to the Contractor on the matter. In constructing the sewer, they gave attention to the gas-mains; but where it was not within a foot of the trench, they did not.

James Bond, a foreman of the works, said the contract was finished about the end of June. He saw no improper ramming or filling; and, in his opinion, the work was properly carried o".

This closed the evidence for the defence, and witnesses were called for the third party.

Mr. *J. Jackson* said he was the Contractor who carried out the works in question, and it was done to the approval of the Engineer of the works, which was expressed continually. In making the sewer they came across the gas-main, and they put up brick piers to support it at spots directed by the Engineer. He could not have done more. The earth always fell away between the piers, but this was impossible to avoid; and it was monstrous to make him liable for the damage. In July also there were heavy rains which softened the trench and made it sink. A waggon went in, but nowhere near the places where the fractures occurred.

By Mr. WHATELEY: He admitted that he was not always at the works watching the ramming; but he invariably had men to do so. The Council had £1300 of his money in hand, in accordance with the contract, as security that he kept the road in good repair.

Mr. *S. Stanbridge*, the last witness's timekeeper on the works, said there were heavy rains in July which made the roads very soft. There was also heavy market traffic; and he saw a steam-roller go over the road in question.

Mr. *H. Jackson*, son of the Contractor, said he was at the works from the time they began till the end. There were three places in Green Lane where the cutting crossed the gas-main, and in these the mains were first slung with chains in the usual way, and then brick piers were built under them. The filling in between the piers was well rammed in 9-inch layers, according to the specification. He did not see the steam-roller.

By his LORDSHIP: He believed the cause of the fracture was the sinking of soil over the mains, and heavy traffic over the roads.

Abraham Newman, another foreman, gave similar evidence as to the care taken when dealing with the gas-mains.

Mr. *Stanbridge*, recalled, said he saw a steam-roller go over the spot where the gas-main was broken opposite Camden Terrace on the 31st of October.

Mr. *Whiteley*, recalled for the plaintiffs, said it was not true that the steam-roller had gone over the trench. He told the driver if ever he went on the trench he would discharge him at once. The roller was at work patching the road on the opposite side.

Charles New, the driver of the steam-roller, said he remembered rolling Green Lane, but he did not go over the trench. The roller weighed 12½ tons.

This statement was confirmed by a man who was also on the roller while it was at work.

This concluded the evidence.

Mr. RUSSELL then addressed the Jury for the defendants. He said with regard to the third party, he should be prepared to contend that, under the terms of the contract, the responsibility was with the Contractor for any damage done, whether he was negligent or not.

Mr. MACKENZIE said he should ask that the question should go to the Jury whether liability could be fixed upon the Contractor in such a case.

Mr. RUSSELL then dealt with the question of the damage done, and said it amounted at the outside to £47 4s. 8d. He referred to Mr. Valon's evidence in support of this opinion. There was absolutely no ground for saying that the gas-mains had been deflected by the defendants' work. A very small sum would compensate the plaintiffs for all the loss they had been put to.

Mr. DUKE said he thought the question of fact for the Jury in regard to the third party was whether the work done by the defendants was done under the contract; and there was also a question whether the damage was caused by using the material excavated instead of hard core—the former being in accordance with the contract.

Justice LAWRANCE objected to opening the case anew.

Mr. DUKE said he was only there under an order which said that the third party should attend in Court and take such part in the trial as the Judge ordered.

After further discussion,

Mr. DUKE addressed the Jury for the Contractor, calling attention to the evidence which showed that the heavy rains had caused the trench to sink, notwithstanding that it was well filled and rammed, and also to the certificate given by the Council's Engineer that the Contractor's work was reasonably completed according to the contract. The defendants sought to protect themselves from damage by putting the blame upon Mr. Jackson; and he could not help remarking that if this was the position of a contractor with whom his employers were well satisfied, that of a contractor with whom his employers were dissatisfied must indeed be a lamentable one.

Mr. MACASKIE replied for the plaintiffs, declaring that the damage was caused by the sewer work being carried over to the wrong side of the way, and by the Contractor putting in bad material in filling in, which caused subsidence. He contended also that the supervision of the work was insufficient. As to the price of gas to be recovered from the defendants for loss by escape, he asserted that they were entitled to recover the selling price of the article—viz., 3s. 6d. per 1000 cubic feet—as this principle had been laid down by the Court of Appeal in the "arsenic in beer" case.

Justice LAWRANCE, in summing up the evidence, said the main point for the Jury to decide was whether there was or was not negligence, on the part of those who carried out the sewerage work, with regard to the maintenance of the gas-pipes, and whether with this work they took all reasonable care and precaution to see that the mains were not injured. There was also the question, if the defendants were found liable, of the price at which the gas lost should be assessed—viz., at 3s. 6d., the selling price, or at 1s. 10½d., the cost price.

The Jury retired. After deliberating for a considerable period, they returned into Court, and gave a verdict for the plaintiffs, with £200 damages. Judgment was entered accordingly.

It was arranged that the question between the District Council and the Contractor should be argued before his Lordship on his return from circuit. After this was settled, the Jury added that they found no negligence on the part of the Contractor.

Mr. DUKE asked that this might be recorded.

Mr. RUSSELL objected, as he had not really dealt with this question in his address to the Jury.

CAERPHILLY POLICE COURT.—Tuesday, June 3.

(*Before Messrs.* E. OWEN *and* C. H. JAMES.)

Caerphilly Urban District Council v. Rhymney and Aber Valleys Gas and Water Company, Limited—Question as to the Quality of Gas.

There have been pending for several weeks a series of summonses taken out by the Caerphilly District Council against the Rhymney and Aber Valleys Gas and Water Company. The Company, it may be remembered, acquired their undertaking in the upper part of the Valley from the Rhymney Iron Company and in the lower portions from the Council. Four summonses were taken out for alleged offences on the 19th and 25th of February last. The Council contended that on each of these days the Company supplied gas which was not of the proper illuminating power and purity. Though the offences took place in February, the summonses were not obtained until the latter part of April. The hearing had been adjourned from week to week, and the matter finally came on for decision last Tuesday.

Mr. J. SANKEY appeared for the complainants; Mr. IVOR BOWEN represented the defendants.

Mr. SANKEY said the summonses were taken out by the Council against the Company for offences committed on the 19th and 25th of February, they having supplied gas which did not fulfil the requirements of the Act of Parliament. He would be able to prove that on the first-named day the gas which was distributed was not pure, according to the provisions of the Gas-Works Clauses Act, 1871.

Mr. BOWEN inquired how this section applied to the Company.

Mr. SANKEY replied that by section 2 of their Act, the General Act of 1871, and also that of 1847, was incorporated. [Counsel then read section 30 of the Act, which provided that the gas supplied should be tested as to pressure, quality, and illuminating power by a properly appointed tester, who would have authority to open up any section of the main along the road or other place where the property of the Company was, on 24 hours' notice having been given to them prior to such opening. Section 31 prescribed that the illuminating power should not be less than 15 candles. The penalties were fixed by section 36, which made the Company liable to 40s. per day for each day during which the fault should continue. He also read sections from the Act of 1871, which showed that no company should supply gas at less pressure or lower purity than that stipulated by their Special Act. In the event of an offence, the offender or company should forfeit such sum as might be assessed, which should not exceed £20 for one and the same offence.] On March 12, 1901, Mr. Llewellyn Davies was appointed Gas Examiner under the District Council. On the 19th and 25th of February last he visited the gas-works, and from the tests then made found that the gas contained sulphuretted hydrogen. The photometer used was provided by the Company; and therefore there could be no question as to its being in proper order. The Council were entitled by the Act to use the apparatus thus provided. The mode of testing was the recognized one.

Mr. *Llewellyn Davies* was then called, and, in answer to Mr. SANKEY, said he visited the Company's works on 4th and also on the 19th of February, and tested the gas for its illuminating power on the latter day. He knew section 31 of the Act, which provided that the gas should not be less than 15-candle power. He carried out the test according to the Gas-Works Clauses Act, 1871, and found the average number of candles during the three tests was 12·76 candles. On the same date he tested the gas for sulphuretted hydrogen, and found a distinct discolouration of the test-paper.

By Mr. JAMES: He had no unused paper by which to compare with that in the stoppered bottle. He was sure it showed a distinct discolouration. He made ten observations during the space of about an hour.

In re-examination by Mr. SANKEY, witness said if they kept a piece of bibulous paper there was a tendency for the discolouration to dry off. He visited the works again on the 25th of February, and the average of the two tests made showed the illuminating power to be 13·97 candles. He also tested for sulphuretted hydrogen on the 19th and 25th. The tests were made by means of acetate of lead paper. It was usual to leave these papers in for a day; but he only left them for an hour. If the papers produced were left for the whole day, the discolouration would be more distinct.

Cross-examined by Mr. BOWEN: The former Company owned the gas-works for 30 years, and no testing was done; but when the present Company took over the works, apparatus was provided. He complied with the sections of the Act of 1871. He did not deliver his report upon the tests within 24 hours, as required by the Act, but posted it. He made the first examination on the 19th of February, and posted the report from Cardiff on the following day about mid-day. He was not aware that the report did not reach the Gas Manager until the 21st.

Mr. JAMES remarked that the posting or delivery of the notice was a question of law.

In further cross-examination, witness said he took the tests on the 19th without having given notice to the Company. No one was present when he made them, but a man came into the room to do something. Each test occupied from 30 to 35 minutes. He did not test for sulphuretted hydrogen when ascertaining the illuminating power of the gas by photometer. He tested for that impurity by means of acetate of lead papers, which were left on the photometer by Mr. Cawley, the Manager. They were in a box. He made another test when Mr. Cawley was present; and there was no cause for complaint on that occasion. The illuminating power of the gas was much over 15 candles, and there was no sulphuretted hydrogen. There was nothing in the Act of 1871 about noting the atmospheric pressure at the time of testing. On the first day the tests showed practically 2 candles short. He would not agree that gas of 14-candle power gave a better illumination than one of higher power for use with incandescent lights. The colour on the papers produced was such as might be caused by sulphuretted hydrogen on paper steeped in sulphide of lead. It was a brownish-black colour on the bibulous paper.

Re-examined by Mr. SANKEY: When he went to the testing-room, the book of papers was on the photometer. If they were not acetate of lead papers he would not be able to get a colour.

Mr. *W. Spickett*, the Clerk to the District Council, deposed that he had given one notice to the Gas Manager, and regarded it as sufficient for the three tests to be made.

Mr. BOWEN said he was not in a position to bring any evidence to counteract what had been stated by the prosecution. His clients had not received any notice of the test, and therefore he would rely upon the legality of the procedure. He submitted that if the proceedings had been taken under the Food and Drugs Act, and evidence of a similar nature to that which they had heard had been given, the prosecution would have been laughed out of Court. Neither the Gas-Works Clauses Act, nor the provisions of the Special Act of the Company had been complied with. He submitted, as a point of law, that no notice had been given. Taking a *mutatis mutandis* stand between the 1871 Act and the Special Act, the plaintiffs were clearly out of Court. His second point was the delivery of the notice. By sending it by post it would not, in the ordinary course, reach them until the following day. Had this notice or report been delivered in the proper way, it would have enabled the defendants to check the illuminating power. Another point was the mysterious and unnecessary delay which had occurred in the Council issuing the summonses; but this might be due to the Council not meeting. The Company had never made any attempt to avoid their obligation of supplying gas of proper light-giving power.

The Bench retired to consider their decision. On returning,

Mr. JAMES said they had taken the advice of the Clerk in regard to the delivery of the notice, and held it to be not necessary to give it. They found the Company guilty of not having supplied gas of proper illuminating power. With regard to the presence of sulphuretted hydrogen, this had not been proved, and they dismissed the two summonses in this respect. They fixed the penalty at £1 for each of the two offences.

Mr. BOWEN asked the Bench to state a case on their ruling as to the notice; and this was agreed to.

Liabilities of Slot-Meter Consumers.

At the Bath County Court, last Wednesday, before His Honour Judge Gwynne James, the Bath Gas Company sued William Everett, of Fishponds Cottage, Widcombe, for 4s. 4d. in respect of gas supplied. It appeared that the Company supplied defendant with gas on the prepayment system, by which a penny put in the slot of the meter paid for 23 cubic feet of gas. On the 21st of January, the amount in the locked box attached to the meter corresponded with the quantity of gas consumed. After this nobody went to the box for the Company until the 19th of March, when the index showed 2100 cubic feet, for which 7s. 7d. should have been found. Instead of this, however, there was only 3s. 3d. in the box; and therefore it was clear that someone had gone to the box and abstracted the money. There was no suggestion, his Honour remarked, that the defendant had taken it, but he was nevertheless liable; and there would be judgment for the plaintiff for the amount claimed.

Assault by a Gas Manager.

At the Newcastle under-Lyme County Court, last Tuesday, Charles Lowe, grocer, of Audley, sued to recover £50 damages for assault from John Mottram, Gas Manager to the Audley District Council. It was alleged that the plaintiff, who had been in the habit of buying coke from the works, went to fetch some on April 29, when the defendant refused to let him have any, saying he must fetch it from a railway station near. The plaintiff refused to do so; and the defendant knocked him down, and struck him while on the ground. Returning half-an-hour later, the plaintiff was similarly treated; and, among other injuries, his lower jaw was fractured in two places. Defendant maintained that he was not the aggressor, and that a fair fight took place. His Honour said that defendant had in an overwhelming way exceeded his rights, and must pay £15 damages.

Heavy Fine for Stealing Gas.

A man named Joseph Johnson was last Wednesday charged before the local Magistrates with having stolen gas from the Malvern Urban District Council by means of a trick. The Gas Engineer (Mr. H. P. Maybury) paid a surprise visit to defendant's house, and found that the meter had been disconnected, and the pipes arranged in a manner to give the house a supply of gas without its being registered. By the following morning the meter was back in its original position. Defendant's plea was that the supply was faulty; and believing there was water in the pipes, he disconnected the meter in order to obtain sufficient pressure to blow the water out. This plea failed to satisfy the Magistrates, who inflicted a fine of £10.

Illumination Facilities at Manchester.—In order to facilitate the arrangements of the citizens for illuminating their premises in honour of the Coronation, the Manchester City Corporation, have undertaken to lay service-pipes from the mains to the height of 3 feet up the front walls of houses, and to provide an adequate supply of gas at a minimum charge. The arrangement will be in force from the night of Thursday, June 26, until the following Saturday. All devices, however, before being fixed, must be submitted for approval.

Bradford Street Lighting and the Rates.—A Finance Sub-Committee of the Bradford Corporation met last Tuesday to consider the question of street lighting, in consequence of the rejection of the Gas Committee's request to the Finance and General Purposes Committee to provide £31,000 from the district rate for the cost of street lighting (*ante*, p. 1366). On the motion of Mr. Guy, seconded by Mr. Godwin, it was resolved to recommend that the sum of £21,000 be allocated from the district rate to defray the cost of street lighting, on condition that the price of gas should be reduced 3d. (to 2s. 3d.) per 1000 cubic feet. This recommendation will, of course, require confirmation by the Finance and General Purposes Committee; and, as to the attitude of the Gas Committee, it is understood that the Chairman (Mr. J. Freeman) supported the resolution.

MISCELLANEOUS NEWS.

THE LONDON COUNTY COUNCIL AND GAS SUPPLY.

The Charge for Gas in North London—Proposed Legislation.

At the Meeting of the London County Council to-day, the Public Control Committee will present the following report on the above subject :—

The Council on Jan. 28, 1902, authorized us to convene a conference of representatives of the Corporation of the City of London and the Metropolitan Borough Councils in the Districts north of the Thames supplied by the Gaslight and Coke Company, to consider the present high price for gas charged by the Company and matters incidental thereto, and the course to be adopted to obtain a reduction of the price. The conference met on the 7th of March, and passed the following resolutions :—

(1) That in the opinion of this conference the price charged by the Gaslight and Coke Company for gas supplied on the north side of the Thames is excessive, and constitutes a serious burden on the consumers of gas for domestic and manufacturing purposes.

(2) That inasmuch as the management of the Gaslight and Coke Company was condemned by the Select Committee of 1899, and the Company have not complied with the recommendations of that Committee, and there is no immediate prospect, under existing conditions, of any substantial reduction in the price of gas, this conference considers that Parliament should be asked to forthwith intervene to protect the consumers from the present monopoly.

(3) That, having regard to the urgency of the matter, and the attitude of the Government in regard to the Gaslight and Coke Company's Bill of last year, and inasmuch as nearly three years have elapsed since the Select Committee of 1899 reported that "the time has come when a reduction in the standard price might fairly be recommended," this conference earnestly requests the President of the Board of Trade to introduce a Bill in Parliament at the earliest possible moment to give effect to the recommendations of the Select Committee, and that the President of the Board of Trade be asked to receive a deputation consisting of one member from each authority represented at the conference, with a view to the Government either initiating or supporting legislation on the subject.

(4) That in the event of the Government being unwilling to promote legislation for the redress of the consumers' grievance, this conference requests the London County Council, alone or in conjunction with the Corporation of the City of London, to introduce a Bill into the next session of Parliament, for the purpose of securing, either by revision of the present sliding-scale arrangements or otherwise, a substantial reduction in the price of gas supplied by the Gaslight and Coke Company north of the Thames.

(5) That the advantages secured to the local authorities on the north side of the Thames by the City of London Gas Act of 1868 and the Amalgamation Scheme of 1883, as to the supply of gas for public purposes, should not be interfered with.

We reported on the 25th of March that we had asked the President of the Board of Trade to receive a deputation consisting of one member from each authority represented at the conference. We have now received a reply from the Board of Trade stating that, as the President is not in a position to promise to introduce legislation with regard to the Gaslight and Coke Company, he fears that a deputation would not at the present time serve any useful purpose, and suggesting that, if the local authorities concerned decide themselves to initiate legislation, the President would be happy to examine their proposals in draft, and to consider how far he could give them his support.

Having regard to this communication, and to the fourth resolution passed at the conference, requesting the Council, alone or in conjunction with the Corporation of the City of London, to introduce a Bill into the next session of Parliament, we have given directions for a communication to be addressed to the Corporation inquiring whether they would be prepared to co-operate with the Council in bringing in a Bill as suggested, and we are now awaiting a reply.

We reported fully on the subject to the Council on Jan. 28, 1902, and we also had a copy of a comprehensive report, prepared by the Comptroller, sent to each member of the Council; but we may perhaps remind the Council that the Select Committee in 1899 made recommendations with regard to revising the sliding-scale and standard price of gas, and also as to obsolete and unproductive capital of the Metropolitan Gas Companies as follows :—

That whenever any of the Metropolitan Gas Companies again come to Parliament for an extension or alteration of their capital powers, a revision of the sliding-scale should take place, and that the standard price should be reduced to 3s. 3d. to carry the standard dividend of 10 per cent., and that the existing scale of increase and decrease for dividend of ½ per cent. for every penny of decrease or increase of price below or above 3s. 3d. be maintained, and that a secondary or additional scale be imposed which should permit of an increase or decrease of dividend over and above that regulated by the present scale of ½ per cent. for every complete 3d. of decrease or increase below or above the standard price of 3s. 3d. . . . That an effort should be made by any Company having obsolete or unproductive capital to redeem such capital by sinking fund or otherwise.

The South Metropolitan Gas Company and the Commercial Gas Company have already promoted legislation in accordance with the first recommendation of the Select Committee, and the Gaslight and Coke Company themselves introduced a Bill for the latter and other purposes.

We consider that the Council should promote legislation on the lines proposed by the conference, as there seems to be no way in which the consumers in the Gaslight and Coke Company's district can obtain a reduction in the present excessive charge for gas except by an appeal to Parliament. It is, moreover, desirable that uniformity with regard to the three principal Gas Companies should be secured.

We are therefore of opinion that a Bill should be introduced into Parliament containing provisions—

(1) For reducing the present standard price, as recommended by the Select Committee in 1899.

(2) For placing the Company under an obligation to provide annually a certain sum out of the amount available as dividends for the purpose of extinguishing its obsolete capital, as suggested by the Select Committee.

(3) For reducing the standard illuminating power of the gas supplied by the Company from 16 to 14 candles; there being an equivalent reduction in the standard price, and provision being made for the supply by the Company of suitable burners.

With regard to the reduction of the illuminating power of the gas, Parliament having, after full consideration of the case, approved of this reduction, and in view of the more general use of incandescent burners by the public, we think that the Council would be justified in suggesting that the Gaslight and Coke Company should be brought into line with the other two Metropolitan Companies in this respect, subject to the supply by the Company of governed burners to the public suitable for the consumption of gas of the lower illuminating power.

The Solicitor reports that, having regard to the special powers vested in the Council in relation to gas matters, and to the Bills promoted in the past by the Council and its predecessor, the Metropolitan Board of Works, he thinks it could be held that the Council had power to spend money in promoting a Bill as proposed.

We recommend—That the Parliamentary Committee be instructed to promote legislation in the session of 1903 for the purpose of securing a substantial reduction in the price of gas supplied by the Gaslight and Coke Company north of the Thames, as follows :—

(1) For reducing the present standard price of 3s. 9d. per 1000 cubic feet to 3s. 3d., coupled with the secondary scale of increase or decrease of dividend recommended by the Select Committee.

(2) For placing the Company under obligation to provide annually a certain sum out of the amount available as dividends for the purpose of extinguishing its obsolete capital.

(3) For reducing the standard illuminating power from 16 to 14 candles; there being an equivalent reduction in the standard price.

Gas Testing by the Portable Photometer.

The Committee will also present a report on the results of the testing of gas by the portable photometer during the year ending the 31st of March last. The total number of tests made was 194; the number above 16 candles being 62, and the number above 15·5 candles being 93, or 47·9 per cent. The average for the Gaslight and Coke Company was 16·01 candles; for the South Metropolitan Gas Company, 14·64 candles; and for the Commercial Gas Company, 16·29 candles. The details are given in the following table :—

Tests showing Illuminating Power of the Gas to be—	Gaslight and Coke Company.		South Metropolitan Gas Company.		Commercial Gas Company.	
	No.	Approximate Percentage of the Whole.	No.	Approximate Percentage of the Whole.	No.	Approximate Percentage of the Whole.
Above 16 candles . .	52	58·5	2	2·0	8	73
Between 15·5 and 16·0	20	22·5	8	8.5	3	27
,, 15·0 ,, 15·5	17	19·0	14	15·0	..	..
,, 14·0 ,, 15·0	..	..	63	67·0	..	..
,, 13·5 ,, 14·0	..	..	7	7·5	..	..
Total . . .	89	..	94	..	11	..

Note.—The standard for the three Companies was 16 candles during the year, with the exception of the South Metropolitan Gas Company, who gave notice under their Act to reduce the standard of illuminating power to 14 candles from July 1, 1891.

Referring to these tests, the Committee say: The testings of illuminating power shown in the above table in the area supplied by the South Metropolitan Gas Company were carried out in accordance with section 6 of the Company's Act; and we understand that if the testings had been made when the gas was burning at the rate of 5 cubic feet per hour, or by a method which would probably be prescribed by the Metropolitan Gas Referees for testing 14-candle gas, at least 54 per cent. of the results would have been below 14 candles, and about 8 per cent. below 13 candles. We may mention that a similar clause was introduced in the Bill promoted in the present session of Parliament by the Commercial Gas Company; but the Council opposed the clause, and it was withdrawn—thus leaving it to the Gas Referees to prescribe a suitable method for testing the gas of 14-candle power which the Company propose to supply.

In order to remedy the present mode of testing the gas supplied by the South Metropolitan Gas Company, and to make the testing of gas as uniform as possible, we are of opinion that it is very desirable that steps should be taken to obtain the repeal of the section referred to. The Solicitor reports that, as the Council is the authority which superintends the testing of gas for the three large Companies in London, he thinks it would be within the power of the Council to spend money in promoting a Bill in Parliament to obtain the repeal of the section referred to.

We recommend—"That the Parliamentary Committee be instructed to include a clause in one of the Council's Bills for the session of 1903, with the object of obtaining the repeal of section 6 of the South Metropolitan Gas Company's Act of 1900, and thereby leaving the Gas Referees to prescribe the method of testing the gas supplied by the Company.'

The Committee will further report the result of the proceedings taken against two of the Companies with respect to the illuminating power of their gas. On the 15th of February, the gas at the Hornsey Road testing-place was 15·32 candles, and on the 17th of that month, the Commercial Company's gas at the Parnell Road station was 15·4 candles. In each case a fine of £2 2s. and costs was imposed.

Lincoln Water Supply.—During the past year the Lincoln Water-Works realized a profit of £2867, out of which a grant of £1500 has been made in aid of the rates. The quantity of water pumped was 542 million gallons, or an increase of 18 million gallons over the previous year. The daily consumption per head of the population amounted to 27·8 gallons. It is estimated that during the present twelve months £5000 will be spent in boring at New Boultham.

POSITION OF THE DUNDEE GAS UNDERTAKING.

Explanations in Committee.

A Meeting of the Gas Committee of the Dundee Corporation was held on Monday of last week, to consider the accounts and estimates and the price of gas. These subjects were much mixed up with the position of the gas undertaking and the condition of the works as reconstructed. They are referred to in the "Notes from Scotland" this week; but we give below a fuller account of the proceedings.

Mr. High commenced the discussion by objecting to the estimates being discussed. He said he only received the statement in the forenoon, and had not had time to go over it. He pointed out that the money they had saved on coal alone was equivalent to a reduction in the price of gas by 3d. By the Sub-Committee buying coal as required, instead of contracting for it, they had saved £5500. But for this saving, the loss on the works for the past year would have been £13,000 instead of £7700. He wished to know why, in the face of all this money saved, there was such a large deficit? Just that day he went to the gas-works, and examined the new retort-house. He found in the case of the large bench that the mechanical stoker was drawing the lower tiers every four hours; whereas the top tiers required a period of eight hours for carbonization. He held that the coal should be all carbonized in four hours, both in the upper and the lower tiers; but the reason of the difference was that the retorts had been constructed without "baffles," and so could not carry sufficient heat to the upper tier to carbonize the coal in less than eight hours. Even after eight hours, he saw them drawing out raw coal; and instead of selling coke they were selling from 15 to 20 per cent. of good coal as coke. The sooner they pulled down the retorts and reconstructed them, the better it would be, as the present construction was entirely wrong. He thought the whole question should be remitted to an expert. The Convener (Mr. Ballingall) explained that a deputation had visited Glasgow, and had interviewed Mr. Foulis, who had promised to come to Dundee and inspect the works. Mr. High thought another expert should be called in, as Mr. Foulis had not the necessary time. Bailie Robertson thought they should appoint a Special Committee, consisting of members of the Gas Committee and representatives of the other Committees, in order to find out what was wrong at the works. The Committee could have the advice of Mr. Foulis and of other experts if necessary; but the matter should be thoroughly inquired into, and the blame placed where it should be. Questions were put to Mr. W. M'Crae, the Manager, on various points, especially in regard to the efficiency of the retorts. In regard to the upper retorts, he said they were charged to a greater extent than the lower ones, and therefore required more time to carbonize. In reply to a question as to where the saving of £5500 on coal had gone to, he attributed it to the decreased efficiency of mechanical stoking as compared with hand stoking. Mr. Brownlee asked if this was the Manager's own opinion, and the opinion of Mr. Foulis. Mr. M'Crae replied that he did not know Mr. Foulis's opinion on the point, but that it was the opinion of many gas managers frequently stated in professional papers dealing with the subject. Mr. Brownlee asked if the Manager had acquainted the Committee with his views as to the relative efficiency of mechanical and hand stoking. Mr. M'Crae replied that he had not entered fully into the subject. Mr. Melville asked the Manager why there was an increase in the estimate for the repair of retorts amounting to £1300, when the Committee had been given to understand that £300 or £400 would repair them. Mr. M'Crae replied that, so far as he could judge at the time, he thought the sum would be sufficient. One reason for the cracking of the retorts was that they had been started too soon. A member asked who was to blame for that occurring. Mr. M'Crae replied that he supposed he was to blame; but he had done it in his efforts to meet the wishes of the Committee, who desired the new retorts to be put in operation without delay. Several inquiries were made regarding the cost of carbonization and the yield of gas per ton; it being stated that the working results showed a production of almost 12 per cent. under the analysis. Mr. M'Crae claimed that an adequate return had been obtained from the coal; explaining that the results of actual working could never yield the same proportion as was secured in analytical apparatus. As to the plans for the retorts, he said he expected the same results as from the old ones, and besides they were submitted to Mr. Foulis and approved. The value of the works was something like £364,000. The total indebtedness of the department, it was pointed out, was about £420,000; so that they were over-capitalized to the extent of £56,000. Several members pointed out that the estimates had been framed on the basis of the experience of the past year; but they thought they might reasonably expect this year they would get more benefit from the new machinery. Bailie Stevenson said in the "Dundee Advertiser" was a statement that the Sub-Committee interfered in the management of the works. So far as he was concerned, this was not the case. The Committee only dealt with coal contracts. All responsibility for the conduct of the works, and for their construction, rested with the Manager. Mr. High put a number of questions to Mr. M'Crae, who said he did not know where Mr. High obtained his information, but it was entirely wrong. It was stated that the reconstruction of retorts had been stopped till the works had been examined by Mr. Foulis; and the meeting finally agreed to delay consideration of the matter till he had reported.

Chard Town Council and the Gas-Works.—The Chard Town Council have decided to promote a Bill for the purchase of the gas-works, in accordance with the powers conferred upon them by the clause inserted in the Bill of the Company in Parliament, as noticed in our "Gleanings from the Committee Rooms" on the 6th ult.

Southport Gas and Electricity Supply.—On the Southport Electricity undertaking the gross profit on a capital expenditure of £162,811 is £10,704, and the net profit £1682, or only 1·04 per cent. The Gas Estate beats this. On their capital expenditure of £263,000, a gross profit of £19,469 is made, or 7·4 per cent., and a net profit of £7923 or 3·01 per cent.

LOUGHBOROUGH CORPORATION GAS SUPPLY.

The Past Year's Working.

At the Meeting of the Loughborough Town Council on Monday last week, the Engineer and Manager (Mr. E. Onions) reported that the accounts for the year ended the 31st of March had been certified as correct. He presented a copy of the revenue account, which showed that the total receipts amounted to £18,760 (gas-rental figuring for £14,482), and the expenditure to £13,749; leaving a balance of £5011 to go to the profit and loss account. As the instalment for the sinking fund, interest on loans, and income-tax required £6139, there was a deficiency of £1128, which would be met out of the general district rate. Alderman Bumpus said the figures presented gave the result of the working for the financial year ending the 31st of March, and their balance was £5011. He thought they would all agree that this was very satisfactory, and a result on which they might very reasonably congratulate themselves. The slot meters and the increased demand for gas-stoves were chiefly responsible for the increase. During the year the quantity of gas sold had risen by 10 per cent., and the profit made was largely in excess of what was estimated—viz., £4078. They had in round figures £1000 more. Some members of the Council might be curious to know why this was so. He could assure them that there had been no starving of the works. There had been the full average amount spent in maintenance. There were two or three reasons to account for it. The price of residuals had fluctuated, particularly that of coke. It had done so greatly during the last three or four years. This had realized several hundred pounds more than they dared to think it would do in their forecast. Slot consumers had gone on increasing in number, and the income for the year from this system was £764. They had obtained more gas out of a ton of coal than they had done in the previous year. They were told that the Gas Company got 9100 cubic feet of gas per ton. This year they had obtained 9890 cubic feet, which was the result of more accurate carbonization. The gas unaccounted for was 1 million cubic feet less than in the year 1900-1901. The better results obtained per ton and the reduction in the leakage spoke for the efficient administration of the works; and it was only fair that they should give credit to the Engineer and those who co-operated with him for this successful result. It was the first completed year they had had. For the last ten years of the Gas Company's management the profit averaged, in round figures, about £2500. In the first completed year in the hands of the Corporation their profits were a little over £5000. In a controversy on municipal *versus* private management, they could show that municipal management would not suffer in this particular instance. They wanted £1000 less from the rates in respect of the working of the gas undertaking for the year ending the 31st of March than was expected. In the estimates for the present year, they asked for £288 less than they estimated they should need to meet the Finance Committee; and he thought the Gas Committee would find themselves with still more to their credit which would go to the benefit of the rates at a later date. If they had a reasonable expansion of their trade and profits during the next few years, they would be in a more comfortable financial position than they had ventured to anticipate, though those who had had to do with the undertaking had had no fear of its ultimate success. The report was adopted.

ST. HELENS CORPORATION GAS SUPPLY.

The Past Year's Working—Reduction in Price.

At the Meeting of the St. Helens Town Council last Wednesday, the Chairman of the Gas Committee (Alderman Cook), in moving the adoption of their minutes, reviewed the work of the department for the past year. He stated that the total quantity of gas made during the year was 357,236,000 cubic feet; being an increase of 4·8 per cent. on the previous year. The gas sold was 338,169,000 cubic feet—an increase of 6·43 per cent. This was inclusive of 77,323,000 cubic feet which passed through the prepayment meters, a rise to the extent of 23½ per cent. It was also inclusive of 12,936,000 cubic feet used in 93 gas-engines, with an aggregate of about 706-horse power, being an increase of 25·6 per cent. The Committee were looking forward to a large augmentation in the supply of gas for engines. A member of the Committee who had put one in place of his steam-engine told them that it did not cost him more than about one third of his former outlay. The unaccounted-for gas was 4·3 per cent., against 5·75 per cent. before. The smallness of this figure was a surprise, for there had been an enormous amount of leakage during the year; the total of the drawn joints, split sockets, and broken pipes numbering 646, which was two-and-a-half times the normal quantity. Raw material cost £3590 less than in the previous year; but the Committee received for residuals £1111 less. The total amount of cash collected from the coin meters through the year was £10,680—an increase over the previous year of £2047—or 23·7 per cent. The number of pennies was 2,563,168; the weight of this copper being 22½ tons, or 4 tons more than in the previous year. For use when counting the coins their Manager (Mr. Samuel Glover) had invented a machine which was most successful, and reduced the time of counting by about one-half. The Committee had had 904 new consumers during the year, bringing up the total to 9325, an increase of 10·7 per cent., of which 5693 were coin and 3632 ordinary consumers. They had fixed during the year 1302 additional stoves and boiling burners, and now had in use 3300 cooking-stoves, 1571 heating-stoves, and 1544 boiling-burners; making a total of 6415 of these appliances, or 25 per cent. more than before. There had been affixed 29 additional public lamps during the year, and they had now a total of 1688. With regard to the financial results of the year, the gross profits were £22,398, out of which there had been paid or provided for interest and sinking fund £10,834; depreciation of meters and stoves, £2080; and superannuation fund £51—making a total of £12,966, and leaving a net profit of £9432. The Committee recommended that the profits should be appropriated as follows: To the borough fund, £2500; to the borough fund, as a special grant to

meet extraordinary expenditure during the current year, £1000; to the capital account, to pay for a new locomotive, new exhauster, station meter, and extensions of mains and services £5147; and the balance (£785) to the reserve fund. He had before him a list of eight Lancashire and Yorkshire towns where the Gas Committees had failed to make any profit at all, and others very little. Mr. Glover assured him that the result he had stated had been attained without starving the works, which had been maintained in the most efficient and satisfactory condition. The Committee recommended that the price of gas should be reduced all round by 3d. per 1000 cubic feet, equal to a 10 per cent. reduction. This was deferred until the 1st of July, because all the slot meters would have to be set so as to make them give 33 instead of 30 cubic feet of gas for 1d. He very confidently recommended the Council to pass the minutes. Mr. Shaw seconded the motion. The Mayor (Colonel W. W. Pilkington) said he thought they must all agree with him that the statement made by Alderman Cook was exceedingly satisfactory. He considered very great credit was due both to him and to the Manager—to Alderman Cook for the interest he had for years taken in this department, and to Mr. Glover for his untiring perseverance, energy, and great ability in the management of the gas-works. The minutes were confirmed.

BURY CORPORATION GAS SUPPLY.

Substantial Reduction in Price.

The annual report of the Engineer and Manager of the Bury Corporation Gas-Works (Mr. H. Simmonds) has just been issued. In it he states that the quantity of gas made during the past financial year amounted to 369,950,000 cubic feet, besides which there was produced from benzol 197,000 cubic feet, making a total of 370,147,000 cubic feet. There was sold to private consumers 323,386,000 cubic feet, and for public lighting 29,124,700 cubic feet; while there was used on the works and for the public clocks 8,333,900 cubic feet—making a total of 360,844,600 cubic feet. The loss through leakage, condensation, &c., was equal to 2·7 per cent. The consumption of gas for the year shows an increase equal to 1·3 per cent. The cost of manufacture, distribution, &c., per 1000 cubic feet of gas sold was 2s. 6¼d.; the net cost being 1s. 6¼d. Adding the interest on loans, stock, and sinking fund made a total of 2s. 1¾d. The income from the gas sold was at the rate of 2s. 4¼d. per 1000 cubic feet; giving a profit (amounting to £3858) of 2½d. The report also gives the estimated cost of manufacturing the gas for the ensuing year. The total gross cost of manufacture, distribution, &c., per 1000 cubic feet of gas sold is estimated at 2s. 3¾d.; the net cost, with interest, at 1s. 11d. The revenue is put at 2s. 1d.; giving an estimated profit (£3000) of 2d. per 1000 cubic feet. With regard to the public lamps, the report sets forth that at the close of the previous year there was a total of 2243 lamps connected to the mains; since added 10, making a total of 2253. On March 31, 1901, there were 1537 cooking-stoves in use; at the end of last year there were 1699. There are in use 2145 grillers, or an increase of 700. Of prepayment meters, 1520 were in use at the end of the year; being an increase of 120. Of new meters 767 were fixed, varying in size from 2 to 150 lights; and 95 gas-fires and 17 boilers were put in. Of new mains, 2242 yards were laid, varying in size from 3 to 8 inches internal diameter; and 1603 yards were replaced. The Gas Committee have resolved, in view of the foregoing report that the sum of £1929, being one moiety of the profits, shall be carried to the credit of the general rate, and the other moiety, to the credit of gas consumers. The Committee have also decided that the price of gas to consumers within the borough (except the "added areas") shall be 2s. 2d. per 1000 cubic feet, less 1d. for prompt payment, and to consumers within the "added areas," and outside the limits of the borough, 2s. 11d., less 1d.; that for motive power the price be 2s. per 1000 cubic feet, less 1d.; that 2d. per 1000 cubic feet of gas consumed be allowed in reduction of the price from the amount now standing to the credit of the gas consumers; and that the price of gas supplied through prepayment meters be 1d. for 30 feet.

SOUTH AFRICAN LIGHTING ASSOCIATION.

The Thirteenth Annual Meeting of this Association was held at the London Office last Wednesday—Mr. D. Ford Goddard, M.P., in the chair.

The Directors in their report stated that the results of the working in the year ending Dec. 31 last at both Port Elizabeth and Grahamstown had been satisfactory; there having been a marked advance in the sales of gas in both places. The accounts accompanying the report showed a balance of £10,511 on the profit and loss account. The interim dividend of 4 per cent. paid in October amounted to £2400; the Directors had placed £2000 to the reserve; and out of the available balance they recommended a final distribution of 6 per cent., making 10 per cent. for the year (free of income-tax), which would leave a balance of £2511 to be carried forward.

The Chairman, in moving the adoption of the report, congratulated the shareholders on the conclusion of peace in South Africa. He referred to the difficulties experienced in carrying on the undertaking during the past year, especially in connection with the discharge of the coal ships. He thought, however, the report might be considered satisfactory. While congratulating the shareholders on the results achieved, he expressed the indebtedness of the Association to the local officials (Messrs. Armour and Arnott) for all their efforts on its behalf, and acknowledged that the uniform success of the undertaking hitherto had been largely due to their ability and zeal.

Mr. J. Mansergh seconded the motion.

Mr. Corbet Woodall, Consulting Engineer to the Association, emphasized the remarks of the Chairman in regard to the difficulties experienced by the local officials in carrying on the business of the Association.

The report was adopted, and the dividend declared.

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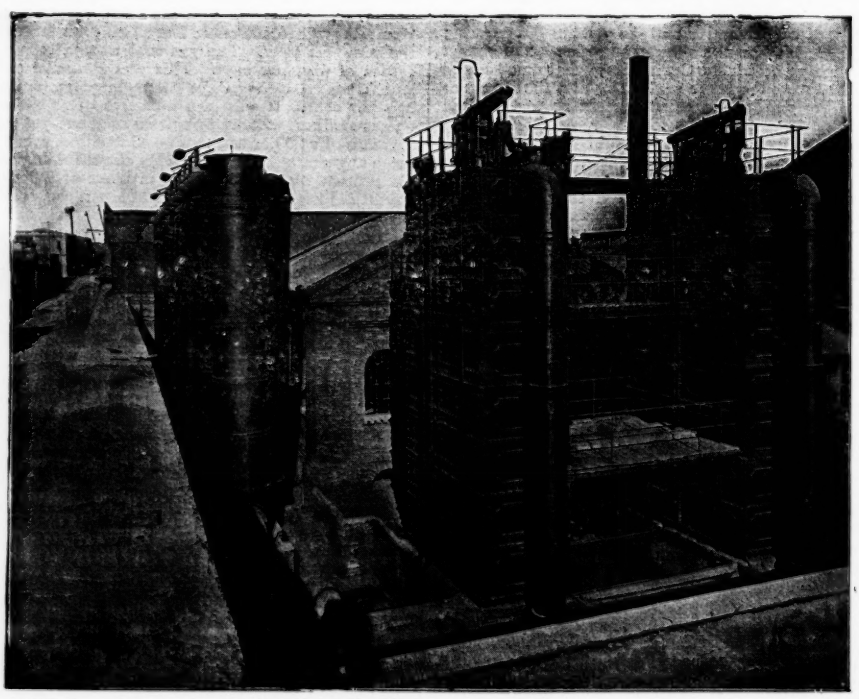

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WALKER'S PATENT CONDENSER AND PURIFYING-MACHINE AT SANTIAGO GAS-WORKS.

NEWBURY CORPORATION GAS SUPPLY.

A Suggested Bonus Scheme.

The report and balance-sheet of the Newbury Corporation Gas-Works for the year ending March 31 were presented to the Town Council at their last meeting. In moving the adoption of the report, Alderman Smith said the results had considerably exceeded the anticipations of the Committee. The output of gas for the year was more by 3 million cubic feet than that of the year before; and while the cost of coal had remained about the same, a few more cubic feet of gas per ton had been extracted. The gross profits for the year amounted to £2531; and the net balance was £959. The charges of management had rather increased; but this was largely due to the improvements in the public lighting, and a slight increase in the labour department. The percentage of coke used in the works had been reduced to 28·2 per cent.; whereas the general average was 33 per cent. In addition to the profits mentioned, the price of gas to ordinary consumers had been reduced; while the charge for public lamps had been lessened, and the whole of the gas for the outfall works was supplied at cost price. The Committee did not propose to further reduce the price of gas at present. Mr. Lewendon seconded the motion. Mr. Gould congratulated the Committee on the excellent balance-sheet, but regarded it as very bad finance to have a continual overdraft at the bank. The stock of coke, he said, was much larger than usual; and he asked why it was not sold to the poor at reduced prices. The percentage of unaccounted-for gas, which was one-twelfth of the whole output, was very high. He thought the Council should do all in their power to encourage their workmen; and with this idea, he moved an amendment that 2 per cent. of the net profits be distributed as a bonus among the employees at the works. Mr. Benn seconded the amendment. Alderman Lucas thought the introduction of the bonus system would be establishing a very awkward precedent, as it would be unfair to give a bonus to one department and not to another. Apart from this, too, there had been no complaint of any kind from the men themselves. Mr. Harris also objected to the amendment on several grounds. The wages of the men were advanced a twelvemonth ago; and if the present proposal were carried out, the accounts would be much complicated. If it was decided to give the men another advance (which he should not advocate), let them do so. The men were very well paid; and he advised the Committee to be as careful as possible not to spend more than they were absolutely obliged, in view of the heavy outlay in the future, including a new gasholder. Mr. Jackson supported the amendment, believing that it would stimulate the men to be careful. Alderman Smith said there had never been a word of complaint from any man in their employment. The Committee had always striven to do justice to both workmen and consumers. On a vote being taken, the amendment was only supported by the mover and seconder and Mr. Jackson.

An exhibition of the gas appliances of Messrs. R. & A. Main, Limited, was held in the Albert Hall, Stirling, last week.

BRUSSELS MUNICIPAL GAS SUPPLY.

Report of the Gas Committee for the Past Year.

The report of the Gas Committee of the Brussels Municipality for the year ending Dec. 31 last, which has lately been issued, shows that the total quantity of gas sold was 35,353,563 cubic metres, or about 1248 million cubic feet, compared with 33,230,000 cubic metres, or 1173 millions, in the year 1900. The total production of gas reached 43,315,380 cubic metres, or 1529 million cubic feet, against 40,768,250 cubic metres (1439 million cubic feet) the preceding twelve months; being 2,547,130 cubic metres, or about 90 million cubic feet, more than before. The entire bulk of gas was disposed of as follows:—

	Cubic Metres.
Lighting	26,924,305
Municipal and other establishments	1,315,800
Gas-engines	3,470,199
Heating purposes	3,357,835
Illuminating devices, balloons, &c.	80,337
Artisans' dwellings and miscellaneous	205,087
Total sold	35,353,563
Public lighting and illuminations	5,145,197
Used on the works, &c.	1,639,322
Unaccounted for	1,177,298
Total production	43,315,380

The total receipts amounted to 7,213,563 frs. (£288,542), and the expenses to 5,708,385 frs. (£228,335); leaving a balance of 1,505,178 frs. (£60,207), compared with 1,313,862 frs. (£52,554) the preceding year. Allowing 159,481 frs. (£6379) for the increased value of stores, the profit from the working of the undertaking was brought up to 1,664,659 frs. (£66,586), against 1,817,330 frs. (£72,693).

The portion of the report dealing with the manufacturing operations shows that 134,346 tons of coal were carbonized, and 2586 tons of oil employed for enrichment, last year, compared with 128,669 tons and 1841 tons respectively in 1900. The quantity of coke sold at the works was 856,376 hectolitres (about 2,355,034 bushels), compared with 862,704 hectolitres (about 2,372,436 bushels) the previous year. Tar products were difficult to dispose of, and the prices realized were very low. The sulphate of ammonia, however, was all sold on advantageous conditions. The breeze was utilized, as usual, in the manufacture of compressed fuel, which is employed in heating the retorts and in raising steam. Practically all the ashes produced on the works are sold for making mortar and the repair and maintenance of roads. The manufacturing capacity of the works, as far as coal gas is concerned, has been raised from 10 to 20 million cubic metres, or from about 353 to 706 million cubic feet. The plant in the second works was brought into use last September, and proved a valuable auxiliary to the other works in the winter months. Another setting of inclined retorts is in course of construction. The total amount of capital employed in the under-

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taking at the close of the year 1901 was 28,628,611 frs. (£1,145,144), compared with 26,689,291 frs. (£1,067,572) on Dec. 31, 1900.

With regard to distribution, mains to the extent of 185,078 metres, or about 203,585 yards, occupied the subsoil of the city at the end of the past year, against 184,752 metres (203,227 yards) at the corresponding period of the previous year. The leakage amounted to 2·71 per cent. of the gas sent out, against 2·46 per cent. before. The number of meters in use on Dec. 31 was 32,023—an addition of 2457. There were 549 prepayment meters fixed; bringing up to 3256 the total number of meters of this kind in use in the city. Of interior installations 1500 were fitted up, making in all 11,529; and 497 rising mains were laid on, increasing the number to 4580. The gas-stoves on hire numbered 23,390, against 21,328; and 362 gas-engines, representing 3821 horse power, were at work—the largest number in printing and bookbinding establishments, but some were used in the production of electric current. Outside lanterns are let to private consumers, and 149 had been placed at the close of the year. For the public lighting there were employed 5310 lamps fitted with ordinary flat-flame burners, and 1278 with Welsbach burners; making a total of 6588 lamps, representing 8526 burners. The total number of lighting hours last year was 3837; 1947 burners being extinguished after midnight. Last September, the Gas Committee commenced to substitute incandescent burners for the ordinary ones on the central boulevards of the city; and they purpose continuing the work systematically, in order to improve, first of all, the lighting of the streets in which there is considerable traffic.

The dwellings erected by the Municipality for the use of the workmen contain 58 families; the school in connection with them being attended by 57 children. Baths are provided for the women and children; and the extent to which they are appreciated is shown by the fact that 3483 baths were taken last year. At the works there are baths for the men. The provident fund is composed of deductions from wages and salaries, and last year they amounted to 16,450 frs. (£658); and a similar sum was given by the Municipality. The total revenue was 34,084 frs. (£1363); and the expenditure, 23,438 frs. (£937), of which 12,459 frs. went for sick-pay. The reserve at the close of the year stood at 8512 frs. (£340), which was exclusive of 75 bonds of the City of Brussels.

PETERSFIELD AND SELSEY GAS COMPANY.

Official Opening of the Works.

No time has been lost by the Petersfield and Selsey Gas Company—which was formed last autumn for the purpose of acquiring and amalgamating into one incorporated Company the undertakings of the Petersfield Gas Company, Limited, and the Selsey Gas Company, Limited—in altering and improving the Petersfield Gas-Works so as to bring them into line with modern requirements; and on Thursday last there was an official opening by Mr. W. Nicholson, M.P. The works date back over half-a-century; but at the time of the amalgamation the productive power was being taxed to its utmost capacity. It was therefore necessary to at once extend the plant and mains, in order to meet the growing demands of the district, the population of which had more than doubled in the preceding ten years. Many of the mains have been taken up and replaced by larger ones; and the capacity of the plant in the works has been added to. A portion of the work has been carried out by the Company's own employees, under the personal supervision of the local Manager (Mr. J. H. Lyon). One of the first acts of the new Company, when they took over the undertaking, was to reduce the price of gas from 5s. 6d. to 4s. 8d. per 1000 cubic feet; and since then, as the result of a couple of exhibitions, held in November and May, they have obtained between sixty and seventy orders for cooking-stoves, the majority being from entirely new consumers. The opening ceremony was followed by a luncheon at the Dolphin Hotel.

SALE OF STOCKS AND SHARES.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards submitted for public competition new issues of capital in the Bournemouth, Maidenhead, Tottenham, and Walton-on-Thames Gas Companies, in each case in accordance with instructions from the Directors. The Tottenham Company's issue was £10,000 of "B" consolidated stock, being a portion of the additional capital authorized to be raised under the provisions of the Company's Act of 1898; and it was the fourth sale within the last six months. It fetched, on an average, £100 7s. 5d. per £100 of stock, yielding the purchaser £3 19s. 8d. per cent., the present dividend being 4 per cent. The new issue of the Bournemouth Gas and Water Company consisted of 1000 "B" £10 shares, ranking for a maximum dividend of 7 per cent. per annum—this rate having been paid since 1888. The prices realized ranged from £15 10s. to £16 (an average of £15 12s. 4d.), yielding £4 9s. 8d. per cent. Some consolidated ordinary 5 per cent. stock of the Maidenhead Gas Company was sold at par. In the case of the Walton-on-Thames Gas Company, the small issue of 150 "B" £10 shares, entitled to 7 per cent. dividend, was placed at from £14 to £14 10s. each, being an average of £14 1s. 6d., which returned the investor £4 19s. 5d. per cent.

The London County Council and Gas-Meter Testing.—At the meeting of the London County Council to-day, the Public Control Committee will submit a return showing the number of meters received, stamped, and rejected at their four testing-stations during the year ending March 30 last, with the amount of fees received for verifying them. The figures are as follows: Meters Received, 181,250; stamped, 160,500; rejected, 20,750; fees received, £5840 12s.

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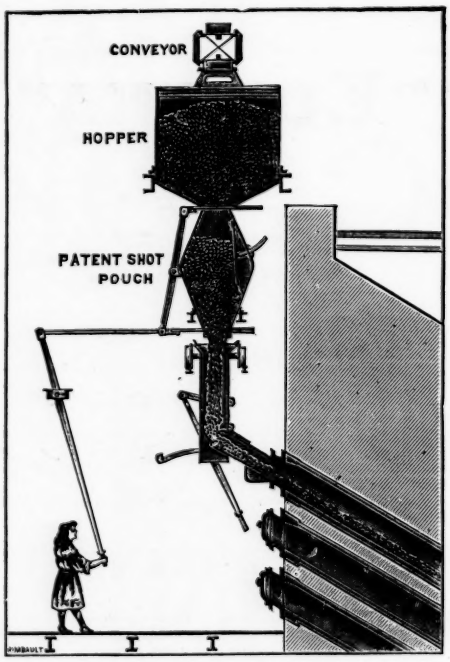

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ADDRESS:—

NEW CONVEYOR CO., LD., SMETHWICK.

ELECTRIC LIGHTING NOTES.

"Backwardness" at Rochdale.

The people of Rochdale evidently know a good thing when they see it; and what is more, they take advantage of their knowledge. At the last meeting of the Town Council, Mr. Butterworth asked the Chairman of the Gas Committee if any of their officials waited upon tradesmen to persuade them to use the electric light. To this Alderman Petrie replied that for years the Corporation had been pressed to erect electric light works; and now they found that tradesmen were backward in using it. The ratepayers, it seemed, preferred to use their good gas rather than that luxury, the electric light. Mr. Sharp said they had spent £30,000 in erecting electricity works; and he was surprised that the use of the light was not pushed. Alderman Petrie pointed out, however, that the works had not been erected solely to supply electric light, but also to furnish power for traction purposes, which they expected would result in a profit to the Corporation.

The Free Supply of Electricity in South Shields.

In the minutes of the Electric Lighting Committee for the monthly meeting of the South Shields Corporation, they report the receipt of a letter from Mr. R. Purvis, Solicitor to the South Shields Gas Company, stating that he is instructed by the Company, who are large ratepayers in the borough, respectfully to call the attention of the Corporation to section 20 of the Electric Lighting Act, 1882, in the hope that they will abandon all idea of supplying free of cost electric light to certain persons during the month of May and the two succeeding months. His clients are advised to take proceedings for an injunction if the Corporation determine to carry out the offer held out in their advertisement. The Town Clerk (Mr. J. M. Hayton) reported, with reference to the section of the Act referred to, and read to the Committee a draft of the following letter:—

Dear Sir,—In reply to your letter of the 2nd inst. in reference to the action of the Corporation in offering electric energy free of charge during May, June, and July this year, to consumers whose premises are wired during those months, the Electrical Committee desire me to point out that this course has been adopted with a view of relieving the pressure upon the department in connecting up new consumers, which usually takes place in the beginning of the autumn. As these consumers will enter into an agreement to take the current until the 30th of September, 1903, there will be no loss to the undertaking, but, on the contrary, the proposal will be of considerable advantage and benefit to it, and is consequently in the interests of the ratepayers. With regard to section 20 of the Electric Lighting Act, 1882, to which you refer, the Committee are unable to see in what way they are showing any undue preference, as all new consumers who are prepared to conform to the terms of the Corporation will be put on the same footing.

Excel Mantles, Limited, is the title of a Company recently registered with a capital of £1000, in £1 shares, to adopt an agreement with H. J. Smith for the acquisition of the business of manufacturers of gas mantles and mantle-rods, or any other business that can be carried on in connection therewith.

SHEFFIELD CORPORATION WATER SUPPLY.

Another Successful Year.

At the Meeting of the Water Committee of the Sheffield Corporation last Wednesday, the General Manager of the Water-Works (Mr. W. Terrey) presented his report for the year ending the 25th of March, accompanied by the accounts.

The total capital expenditure up to that date amounted to £2,890,456, of which £38,515 was spent on what may be called the old works, and £153,073 in connection with those now being carried out in the Little Don Valley under the Act of 1896. The outlay on these works up to the end of the last financial year was £535,248. The total income from water-rents was £136,180, compared with £136,220 before; showing a decrease of £40. As a matter of fact, there was an increase of £993 in the revenue from water supplied for domestic purposes, and a decrease of £1033 in that produced by trade supplies. Adding the miscellaneous receipts, £6458, the total revenue was brought up to £142,638, or £201 more than in the twelve months ending March 25, 1901. The net expenditure connected with maintenance and management was £29,616; and annuities, interest, &c., came to £82,313—making together £111,929. The net profit on the year's working was therefore £30,709, against £32,333 before. The first-named sum is reduced by £7554, the annual instalment set aside for the redemption of annuities and the extinction of loan indebtedness; leaving the net surplus for the year £23,154, or £2329 less than that for the preceding twelve months. This is accounted for by the remission of the remainder of the 25 per cent. increase in the water charges as from the 29th of September last. These are now brought down to the rates authorized by the old Company's Act of 1853; and Mr. Terrey points to the fact that they are among the lowest in the kingdom. If this remission had not taken place, the surplus for the past year would have amounted to £29,439, which would have been an increase of £3956 on the figure for the year 1900-1901 (£25,483). Since the acquisition of the undertaking by the Corporation on Jan. 1, 1888, the total surplus, after discharging all liabilities, including the payment to the sinking fund, amounts to £99,334, out of which £13,218 has been transferred to the district fund, to restore the sum paid thereout in respect of the expenses incurred in obtaining the Act of 1887; leaving £86,116. In future, the annual charges for interest and sinking fund in respect of the loans raised for payment of these expenses will be borne by the water revenue. The obligation represents a charge of about £1000 per annum. The sum thus appropriated, together with the reduction in the charges for water, represents a total of £33,166 applied out of the profits of the undertaking in the past year for the benefit of the city, or equal to 6d. in the pound on the district rate. Mr. Terrey records with gratification the fact that, notwithstanding the period of drought which prevailed during the greater part of the past year, and the consequent large increase in the consumption of water, which seriously taxed the resources of the undertaking, it was not found necessary to restrict or interfere with the constant supply to the district, which has been kept

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up since 1869. The additional number of houses supplied during the year was 2846, making a total of 92,641; and of baths 797, making 8028. There are 3580 water-meters in use, against 3551 last year. The total number of domestic and trade supplies on the 25th of March last was 141,329; being an increase of 8527 "new supplies" during the year. Mr. Terrey closes his report with a brief description of the present state of the works in the Little Don Valley.

NEW RESERVOIR FOR OTLEY.

On Saturday, the 24th ult., the first step was taken in the direction of carrying out a scheme devised by Mr. John Waugh, of Bradford, for providing the inhabitants of Otley with an additional supply of water. The present supplies are derived from various sources, the principal one being a borehole at Menston. It has stood the town in good stead, and but for its existence there would probably have been a water famine in recent years. For twenty years at least these supplies have been known not to be commensurate with the growth of the town; and the District Council failing to get an Act of Parliament in 1899 for the Bow Beck scheme, a fresh start had to be made, and they sought and obtained powers to impound the waters of March Ghyll, in the township of Middleton, near Ilkley, and make a reservoir capable of holding 100 million gallons, or about 260 days' supply for the present population. Last year's flow of March Ghyll—in what was admittedly a dry season—was 40,000 gallons per day. In addition to this there is a gathering-ground of some 970 acres, the whole of which is uncultivated, and does not afford any chance of pollution. The reservoir will be situated in a pretty valley called by the romantic name of the Fairy Dell. Overlooking it on one side is the brown slope of Beamsley Beacon, which, with the adjacent district, forms the watershed of March Ghyll. Operations were commenced by the Contractor (Mr. W. S. Arnold, of Doncaster) in March; and sufficient progress was made up to the 24th ult. to allow Mrs. W. H. Barker, wife of the Chairman of the Council, to perform the ceremony of cutting the first turf of the new reservoir, which she did in the presence of a numerous company, and in charming weather. The spot selected was the commencement of the embankment across the valley. It will be 240 yards long, and have upon it a road, with a bridge across the bye-wash having a span of 30 feet and a width of 17 feet. The lake to be formed will be 20 acres in extent, and vary in depth from 17 to 66 feet. Filters are to be constructed to remove the acidity of the peat and prevent corrosion of the pipes; and there will be an arrangement whereby 150,000 gallons of compensation water may be daily turned on for the use of millowners. The supply to Otley will be by gravitation; March Ghyll being 700 feet above sea-level, or about 400 feet higher than Otley. Seven miles of 10-inch pipe will convey the water to its destination. The total cost of the scheme will be approximately between £70,000 and £80,000. The ceremony was preceded by a luncheon to which the visitors were invited by Mr. Barker and the Chairman of the Water Committee.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen still greater turmoil over the conducting of the Dundee Corporation gas undertaking. It has also witnessed the sudden cessation of attack by the "Dundee Courier," which newspaper began the agitation by the publication of letters to the Editor, signed "More Light." There was a letter from this writer in Monday's issue; but, in view of the possibility that the sudden stoppage of their interest in the subject may be the result of protest on the part of the attacked, I think it better to lay this letter and the "Courier" altogether out of view in the meantime.

Turning to the "Dundee Advertiser," I find that on Monday it gave a fuller statement from the annual accounts of the undertaking than was contained in their evening issue of Saturday, which I was able to send you last week. Having stated that the deficit on the year's working amounts to £7700, it goes on to say that it is proposed to maintain the gas at the same price as before—3s. 6d. per 1000 cubic feet. It is clear, the writer considers, that the prospects held out a year ago have not been realized. At that time, Treasurer Ritchie remarked that "Dundee would within a very short time be in possession of gas-works up to date, fitted with every modern appliance for making cheap gas." At that time there was a deficit from the previous year of £8653, and the estimates were framed so as to bring out a surplus of £810. The details showed how wide that calculation was of the mark. For coal and wages of firemen, the estimate was £51,000; they actually cost £61,284. The purification account had been exceeded by £430, main-pipe repairs by £231, and sinking fund contributions by £1450. There was a reduction upon taxes and assessments to the amount of £1179. The total expenditure was estimated at £108,028; but it had turned out to be £122,043—an increase of £14,015. The estimated income was £108,839. The total amount estimated to be received from the sale of gas was £94,688, and the amount actually received was £99,668. Chemical products realized £1727 more than was estimated. Coke was less than the estimate by £1219. The total revenue was £114,343, or £5504 above the estimate. It was assumed that 563,160,000 cubic feet of gas would be sold; the actual sales had been 592,694,100 cubic feet. In addition, 8,076,000 cubic feet of gas were used in the works, against 6,000,000 cubic feet estimated. Gas unaccounted for amounted to 57,141,500 cubic feet, as against an estimate of 42,840,000 cubic feet. The total quantity of gas manufactured was thus 657,911,600 cubic feet, against an estimate of 612,000,000 cubic feet. The coal account showed that 71,148 tons of coal were carbonized. The total cost of the coal was £49,156—an average per ton of 13s. 9¾d., against an estimate of 14s. 2d. per ton. Carbonizing charges were reckoned at 2s. 6d. per ton of coal, but had actually cost 3s. 4¾d. per ton. Estimates for the current year have been made up, which show an expected output of 660 million cubic feet of gas, to be obtained from the use of 69,474 tons of coal, the cost of which is 12s. 6d. per ton, and the carbonizing charges are 2s. 6d. per ton.

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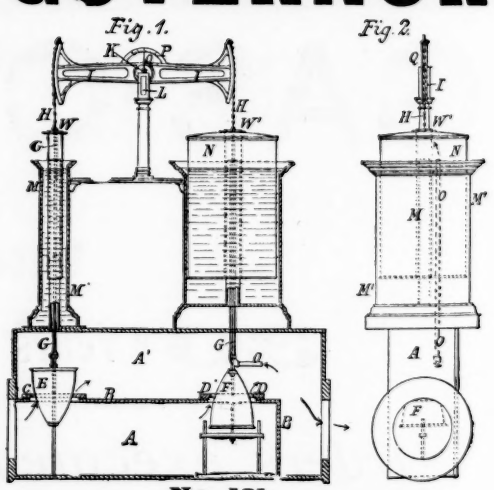

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The cost of coal is put down at £52,105, and the total expenditure at £114,006. The income is estimated at £117,327, leaving a surplus of £3321. The revenue from gas is expected to be £100,826; from chemical products, £10,000; coke, £6300; and other sources, £201.

It had, the article proceeds, been known for a considerable time by those who take an interest in gas affairs, that there was little prospect of matters turning out as was expected at the beginning of the year. The new retorts were not got ready so rapidly as was expected, and the manufacture of coke, which was taken in hand, required an additional amount of labour. But it was only those closely associated with the management of the gas-works who had any idea that there would be such a deficit. As regarded labour, it was calculated that there would be a saving of between £5000 and £6000 by the introduction of new machinery; but, as matter of fact, the estimate of actual expenditure had been exceeded by £4400. Then there had been a considerable divergence between the output of gas per ton of coal, as shown by the analysis, and that actually got from the coal. The analysis showed a yield of 10,300 cubic feet per ton; the yield had been only 9300 cubic feet per ton. Interest and sinking funds had also required more money than was estimated.

As becomes up-to-date journalists, there are appended the views of a number of members of the Corporation upon the situation. One is represented as saying: "I am sick of the gas question, and would willingly wash my hands of it. Several of us will resign unless certain things are done. We bought coal cheaper than was expected by about £5000, and yet there is a deficit of £7700. Some of us have had to devote more time to gas affairs than we should be called upon to do, and it is becoming intolerable. But it cannot go on. We are not gas experts, and we cannot be expected to run a gas-works. How things have turned out so badly I cannot tell; but the Town Council will have to take the whole thing in hand." Another member thought that "perhaps the mistake was in their expecting too rapid results from the reconstruction of the works. He believed, however, that things would turn out all right if they gave the new works a chance." Another member said that "a very unusual state of affairs had been maintained at the works during the past year or two; that the Manager was nominally the head of the works, but that he had been controlled by a Sub-Committee, and everything that was proposed was submitted beforehand to Mr. Foulis. At the same time Mr. Foulis was not the Consulting Engineer of the Sub-Committee, but only gave advice when asked. Evidently the Sub-Committee, who were not experts, had had the control. The whole position had been anomalous."

The Gas Committee met on Monday to consider the statement of accounts and the estimates for the current year. The accounts and estimates were easily approved; but there was considerable difference of opinion in the Committee as to the price to be charged for gas. It came forward on the recommendation of the Committee that £4000 should be added to the contingent fund, which is now £19,500. Bailie Stevenson thought they were only bound to add £2800 to the contingent fund, which was 2½ per cent. of the revenue; and if they applied the £4000 to revenue, they would be able to take 2d. off the price of the gas. Treasurer Ritchie pleaded that they agreed some years ago to set aside the larger sum, and that the money was being applied to the cost of reconstructing works. They had expended £84,000 upon the works, and they would require to lay aside £4000 for the next ten years in order to keep down the capital account. It was also pleaded that the fund was a contingent one, and that, a contingency having arisen, they should apply the money to meet it. The Committee, after a discussion, agreed to recommend the Council, when the accounts are laid before them, to fix the price of gas at 3s. 6d. per 1000 cubic feet, and to place £4000 to the contingent fund. This conversation was mainly upon the efficiency of the works; and as it is important, and there is no room for it in the "Notes," I have sent it as a separate article. [It will be found upon page 1585.] Mr. Foulis, of Glasgow, visited Dundee to-day, and made an inspection of the gas-works. An account of what took place has not yet reached me, so I cannot go further into that branch of the subject. It is really a delicate matter, and it will be wisdom on the part of the Dundee Corporation, as well as all others, to suspend judgment upon it till it be seen in what light Mr. Foulis places it. It is easy for anonymous correspondents and town councillors who have not technical knowledge to glibly express opinions; it is something different when a gentleman like Mr. Foulis, whose experience and ability make him one of the highest possible authorities, looks into the subject. His report will be awaited with a great deal of interest.

Mr. Newbigging has not yet reported the result of his investigations at Perth into the alleged increase of gas bills; but a Dundee newspaper on Monday published a comment upon the business which is quite different reading from previous communications, the outstanding feature of which was an unbounded self-assurance. Now it is said that some little disappointment has been felt by the ratepayers who laid their grievances regarding the alleged excessive charges for gas before Mr. Newbigging; and it is stated that this gentleman held out very little prospect of anything being deducted from their accounts, remarking that the meters were correct, and that the consumers must have burned all the gas in question. And it is added that "many have a feeling that it [the report] will not be at all in terms satisfactory to those whose gas bills are so unaccountably high." I do not look upon this as an interference with Mr. Newbigging's position, so much as a paving of the way for the statement that all is right in connection with the gas undertaking.

The practice of plugging up the end of a gas-pipe when a gaselier is taken away is a common one. It is not altogether a satisfactory method of shutting off the gas, as the plug is apt to work loose with the vibration of the ceiling where the flat above is inhabited. That is doubtless what happened in a house in Cadder Street, Glasgow, on Tuesday. The tenant of the house went into a room with a naked light, to search for an escape of gas. An explosion resulted, which blew out the windows of three apartments and seriously burned himself. It was found that the gas-pipe was not properly plugged.

The Notkin Syndicate, Limited—a Company which was formed in Edinburgh to work a process for the manufacture of oil gas by simply

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passing the oil through a porous substance—is in liquidation, and the patent rights are for sale. The process is so simple that anyone can work it; so there is a wide field for its application. The Company do not seem to have pushed it, which may account for their failure.

The annual meeting of the shareholders of the Bothwell and Uddingston Gas Company, Limited, was held last night. The Directors reported that, in view of putting the capital of the Company on a proper basis, they resolved to issue 5000 new shares of £1 each at par, and at the same time to pay a bonus of 5s. 6d. per share to the shareholders, reducing the reserve fund by £4950. During the past year, considerable extensions and improvements were carried out on the manufacturing plant at the works, including new condensers, scrubbers, lime-store, and plant for the manufacture of sulphate of ammonia—the latter being a source of considerable increase to the revenue of the Company. The balance at the credit of the revenue account for the year, after charging all renewals and bad debts, was £2574. A sum of £508 was written off for depreciation. A dividend was then paid at the rate of 10 per cent., and a sum of £856 was carried forward. The quantity of gas sold during the year was 45,167,000 cubic feet—an increase of 2,022,000 cubic feet. The total revenue was £10,164, of which £6626 was derived from the sale of gas, £2027 from the sale of coke, £405 from tar, and £889 from sulphate of ammonia. Parliamentary expenses amounted to £458, and the new works cost £3186.

The Comrie Gaslight Company earned a profit last year of £25; and they have continued the price of gas at 7s. 1d. per 1000 cubic feet. The Dunning Gaslight Company have continued the price of gas at 10s. per 1000 cubic feet. This is about the dearest gas in Scotland.

It is not often that an unpleasant incident takes place at a meeting of Glasgow Town Council, but there was something which was very nearly so on Thursday. In connection with proposals for increases of salaries, it was pointed out that in the department of the inspector of gas-meters the inspector had two sons in the employment, and they were recommended for an increase of wages, while three other employees who were between them in grade were not to get any addition to their pay. The statement was not contradicted. There was some talk upon it, however, in the course of which a speaker deprecated the getting of fat and easy berths for their relations by Corporation officials and town councillors. Lord Provost Chisholm asked that town councillors be left out of the remark; but the speaker held that the one class were just as anxious as the other, in the matter of looking after the interests of their relatives. The Committee who made the recommendation were asked to reconsider the matter.

Chorley Gas Profits and a Reduction in Price.—The profits on the Chorley Corporation Gas-Works for the past year amounted to £4753, of which £3954 has been taken in reduction of the cost of the carburetted water-gas plant, and £1000 in relief of the rates. The Town Council have confirmed the recommendation of the Gas Committee to reduce the price of gas by 3d. per 1000 cubic feet and abolish meter-rent to ordinary consumers, and to allow the prepayment meter user an additional 2 cubic feet of gas for 1d.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 7.*

Sulphate of Ammonia.

The market has assumed a quite tone; and makers are experiencing more difficulty in disposing of their production. Consequently, prices are barely maintained; the closing quotations being £12 12s. 6d. per ton f.o.b. Hull, and £12 16s. 3d. to £12 17s. 6d. per ton f.o.b. Liverpool and Leith. The Continent is quiet; and Spanish buyers are not so eager as they were recently. But there are considerable requirements for the Colonies; and current production is being absorbed in covering these. Speculators who have June contracts to cover are waiting a better opportunity; and meantime are directing their attention to depressing the market. There is not much interest in the forward position; but makers are firm at recent quotations.

Nitrate of Soda.

This is weak in all positions; and spot prices are down to 8s. 7½d. per cwt. for ordinary, and 9s. per cwt. for refined qualities, respectively.

LONDON, *June 7.*

Tar Products.

The markets generally continue quiet; but the demand for pitch is very strong, and high prices are being paid in London for early shipment. There appears now to be a considerable inquiry for delivery all over next year. Benzol remains in the same depressed state. A small transaction in 90 per cent. is reported at 8¼d.; but it is generally believed that lower prices are being accepted at outports. In Toluol and Solvent there is nothing fresh to advise. There is no business doing in either of the articles. As regards anthracene, it is difficult to fix its value, as there has recently been no transactions of any importance to serve as a guide. Creosote is still very quiet, and large quantities are offering in the North, although the value is fairly well maintained in London. In crude carbolic, business is still being done in 60's at 1s. 11d. per gallon, June-September; but consumers are not inclined to purchase for October-December.

The average values during the week were: Tar, 16s. 6d. to 21s. Pitch, London, 45s. to 46s.; east coast, 42s. 6d. to 43s.; west coast, 38s. to 38s. 6d. Benzol, 90 per cent., 8d. to 8¼d.; 50-90 per cent., 7d. Toluol, 8½d. to 9d. Crude naphtha, 2¾d. to 3d.; solvent naphtha, 9d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¼d.; North, 1d. Heavy oils, 1⅛d. Carbolic acid, 60 per cent., 1s. 11d. Naphthalene, 35s. to 50s.; salts, 21s. 6d. to 25s. Anthracene, "A," 1½d. to 1⅝d.; "B," 1d. nominal.

Sulphate of Ammonia.

The market continues very firm indeed; the position being practically unchanged. The Gaslight and Coke Company still ask £13 for June-July; but for October-March, they would accept £11 17s. 6d. As regards Leith, further business is reported at £12 15s.; and for October-March, there is a strong inquiry. In Liverpool the position

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Among the Companies and Towns supplied are The Gas Light and Coke Company, The South Metropolitan Gas Company, Birmingham, Leeds, Rochdale, Bristol, Sheffield, Southport, Alloa, Broughty Ferry, Dunfermline, and many other Works, both large and small, where they have been working in some instances for the past Seven Years.

MORE GAS & SALEABLE COKE PER TON of COAL CARBONIZED is PRODUCED; SAVING CAPITAL, LABOUR, FUEL, WEAR & TEAR, &c.

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is unchanged, although the demand for prompt is scarcely so strong. Business in Hull has been quiet, with very few sales to report. The market value may be taken as from £12 12s. 6d. to £12 13s. 9d. The market closes decidedly quiet; but at the same time the tone may be considered as generally firm.

COAL TRADE REPORTS.

Lancashire Coal Trade.

The altogether exceptional interruption of operations at pits during the past three weeks, owing to the prolonged suspension of work for Whitsuntide, and the further stoppages for the peace celebrations, together with the more than probable several days' additional stoppages in connection with the Coronation, are necessarily restricting the quantity of all classes of fuel coming on the market; and as a result giving a steady tone to prices, which otherwise might this month have undergone some further reduction. The unsummer-like weather is still keeping up an extra demand for house-fire qualities; and with the lessened output at the collieries, there is an absence of surplus supplies of any moment. Lancashire collieries are generally moving away all they are raising; and the prospect is that it will be very late on in the season before they will be able to put down their usual stocks to meet the following extra winter requirements. Prices remain steady at recent quotations, averaging 13s. 6d. per ton at the pit for best Wigan Arley, 12s. to 12s. 6d. for Pemberton four-feet and seconds Arley, and 9s. 6d. to 10s. for common house coal. The lower qualities of round coal are also to a similar extent affected by the restricted output of the pits. There is not more than a moderate demand for steam and forge purposes; but supplies are not at all excessive, and prices are being fairly well maintained, though some weakening is noticeable here and there on recent full quotations. At the pit, 8s. 6d. to 9s. per ton represents the average figures for steam and forge coal. The shipping demand is fair; but prices are cut low—ranging from 9s. 6d. and 9s. 9d. per ton for common, to about 10s. for better qualities of steam coal, delivered at the ports on the Mersey. The settlement of gas coal contracts is proceeding on much the same lines as indicated in previous reports. The gas coal collieries seem to have held pretty firmly to the general understanding as to the basis on which this year's contracts should be renewed. Some inferior sorts have been obtainable at 8s. 6d. to 8s. 9d. per ton; but the general basis for common gas coal remains about 9s., with better qualities of screened Arley gas coal quoted at about 10s. at the pit. The locomotive fuel contracts have now been practically settled, on an average basis of 8s. per ton at the pit, with 8s. 3d. obtained in some exceptional cases. The position in the engine fuel trade varies a good deal, according to locality and the quality of slack offering on the market. The better sorts of Lancashire slack are fairly steady at late rates, averaging 6s. 6d. up to 7s. per ton at the pit for some of the best descriptions. Common slacks are weaker, if anything, with general quotations about 4s. 6d. to 5s.; but good medium slacks obtainable from Yorkshire and Staffordshire at 4s. to 4s. 6d., and slack from Derbyshire obtainable at about 2s. 6d. at the pit. The coke trade continues strong, with manufacturers all reporting the production rather short, if anything, to meet requirements; and prices are firmly maintained at late rates, averaging 22s. to 24s. per ton for best Lancashire foundry, 13s. 6d. to 14s. for best furnace cokes, 13s. 6d. for best Yorkshire furnace, and 11s. 6d. to 12s. for common furnace cokes, at the ovens.

Northern Coal Trade.

The demand for coal is a little steadier, as some of the large users wish to accumulate a little stock against the coming holidays. The best classes of Northumbrian steam coals are firm, the demand being full; but the second-class steams are weaker. Best steams are 11s. to 11s. 3d. per ton f.o.b.; but for delivery at the end of the month, perhaps 3d. more is asked. Second-class steams are plentiful at from 9s. 9d. to 10s. 3d.; and steam smalls are now more abundant at 5s. to 5s. 3d. Gas coals are now in fair demand, there being larger exports; but the home requirements are now rather low. Prices vary, according to quality, from 8s. 6d. to 9s. 6d. per ton f.o.b.; and one or two local contracts are at rates that show little alteration from those we have previously reported. Manufacturing coal is quiet. Coking coals are steady on the whole; but the exports are only moderate. In coke, there is a slightly better demand. Best Durham coke for export is about 17s. per ton f.o.b., and blast-furnace coke is from 15s. 3d. at the Teesside furnaces. Gas coke is now in smaller supply; but the household demand is locally less, and prices are very difficult to quote accurately.

Scotch Coal Trade.

The coal market as yet shows no sign of improvement—in fact, the Continental demand is falling away in a most unexpected fashion. A slight improvement may be looked for, because Lord Kyllachy last week decided that in the case of coal sold f.o.b. the seller is to pay the duty. The prices quoted are: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. 3d. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 203,616 tons—a decrease of 23,859 tons upon the previous week, and of 8402 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,049,495 tons—an increase of 314,499 tons upon the same period of last year.

Following up their preparation of gas illumination devices in connection with the Coronation, Messrs. James Milne and Son, Limited, have got out a special series for the peace celebrations. We have received from the firm photographs of some very appropriate devices for the occasion.

Messrs. W. J. Jenkins and Co., Limited, of Retford, have just received two large orders for coke conveying and screening plant on the De Brouwer principle—one from the Croydon Commercial Gas Company, and the other from the Salford Corporation, for their Albion Street works.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
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The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.
BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD.	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA.	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN.	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.) 1,000,000 Cub. Ft
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.) 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

An Adverse Balance at Middleton.—Some dissatisfaction was expressed by members when the results of the past year's working of the Middleton Corporation Gas Department were placed before the Town Council. The customary profit has on the present occasion disappeared, and instead of it there is a loss of £3725. In presenting the balance-sheet, the Chairman of the Gas Committee (Alderman Walker) explained that the cause of this was an error of judgment in not putting sufficient money aside for the renewal of worn-out retorts; while there had also been a serious fall in the value of residuals, and the consumption of gas in the town had (through bad trade) seriously fallen off. Several members of the Gas Committee acknowledged they were in a humiliating position; one going so far as to say that, were he not a member, he should move that the Committee be asked to resign *en bloc*. Alderman Lord said there had been a mistake somewhere; and they must see that they made arrangements so that such a thing did not occur again. The balance-sheet was allowed to lie over for consideration at the next meeting.

Neath Corporation Gas Supply.—At a recent meeting of the Neath Town Council, the Gas Manager (Mr. A. R. Browning) reported that on the revenue account the gross profit on the past year's working amounted to £4258; being an increase of £1522 upon the previous year. This result was due, to a great extent, to the material reduction which had taken place in the cost of coal. There was an increase of £1080 in the gas-rental, and the residual products showed an advance of £174; the total receipts being £15,333, against £14,086, or £1247 more. The balance of profit was appropriated as follows: After paying £1224 interest, £176 had been carried to the depreciation fund account, which showed a credit balance of £100. After meeting all demands, interest on loans, &c., and the repayment of principal (£2550), they were able to carry forward the substantial balance of about £500. These results had not been obtained by raising the price of gas to meet the extraordinary advance in the price of coal for the past two years. Gas at 3s. 2d. per 1000 cubic feet, with an average illuminating power of 16 candles, would compare favourably with other towns in South Wales. The report was adopted.

The New Gas-Works Scheme at Aberavon.—There is something like a hitch in the Aberavon Town Council's scheme for building new gas-works. This has been brought about through the original estimate of the Engineers (Messrs. T. Newbigging and Son) having been exceeded by upwards of £4000. The Local Government Board have pointed out to the Corporation that their borrowing powers for gas-works purposes only amount to £11,325, whereas the proposed expenditure exceeds £15,000. Messrs. Newbigging have therefore submitted an amended estimate which reduces the cost to £11,307. Of course, the proposed new works will, under this estimate, be shorn of much of their completeness; but the Engineers state that nothing material to the make of a plentiful supply of good gas has been omitted. The question of offices has for the time been abandoned.

John Wright and Eagle Range, Limited, held an exhibition of their gas appliances in the Town Hall, St. Andrews, last week. It was opened by Provost Welch, of St. Andrews. Miss Margaret Lovell was the lecturer.

Messrs. Ashmore, Benson, Pease, and Co., Limited, of Stockton-on-Tees, have recently been recipients of the following orders: From the South Shields Gas Company, for four purifiers 35 ft. by 25 ft., of the luteless type, staging, and 24-inch steel mains; from the Tynemouth Gas Company, for six purifiers 26 feet square, also of the luteless type; and from the Croydon Gas Company, for a cast-iron tank 48 feet square and 9 feet deep, superstructure, flooring, and roof for compressing plant buildings.

The Directors of the European Gas Company, Limited, have decided to recommend to the shareholders, at the annual general meeting to be held next month, the payment, in respect of the financial year ended the 31st of March, of the usual dividend of 10 per cent. and a bonus of ½ per cent., free of income-tax, but less the interim dividend of 4 per cent. paid in February, and subject, with regard to all shares held in France, to a deduction for French transfer duty of 1s. 1d. on each fully paid £10 share, and 10d. on each £10 share on which £7 10s. has been paid.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571 Central.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON HOUSE,
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"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

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FOR GAS PURIFICATION.

THE DUNSTABLE LIME COMPANY,

Works: Sewell, Dunstable, Knebworth, Stamford, and Peterborough, Great Northern, Midland, and London and North-Western Railways.

Copy of Analysis of Lime from Knebworth Works—

Calcium Oxide (Quick Lime) . .	98·9
Magnesia and Alumina	0·5
Silica	0·6
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Head Office: PETERBOROUGH.

BROTHERTON & CO, LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.

MELROSE CYCLE COMPANY, COVENTRY.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.

Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

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ERSTE Hollandsche Yzererts Maaty. (The First Dutch Bog-Ore Company, Limited), ROTTERDAM.

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GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA

SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

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H. GREENE & SONS, Ltd., are pre- pared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

19, FARRINGDON ROAD, LONDON, E.C.
Telegrams: "LUMINOSITY."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

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State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE Cement, Paint, Mains, Tubes, STREET LANTERNS, GLASS, TOOLS, &c.

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5, CROOKED LANE, CANNON STREET,
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BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
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For all Ammonia Joints.

PROVINCIAL Gas Companies may pro- fitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.

Correspondence on this subject is invited by the ACETYLENE ILLUMINATING COMPANY, LIMITED, 3, Victoria Street, LONDON, S.W.

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MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

EINE bedeutende deutsche Firma der Gas und Wasserleitungs branche (engros) wünscht Addressen und Preislisten Englischer Fabrikanten von Fayence-Sanitäts-Utenstlein, &c.

Offerten unter X.Y.Z. 49, an Haasenstein and Vogler A. G., HAMBURG.

A FIRM of Coal Contractors having extensive connection in British Isles with Gas Companies, is open to NEGOTIATE with large PRODUCERS OF OIL for ENRICHMENT.
Address, in first instance, No. 3872 care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

METER Inspector and Repairer for large scattered district Wanted.
Write to "WATER," care of Gould's Advertising Offices, 54, New Oxford Street, LONDON.

FOREMAN required to take charge of Purifiers and General Yard Work. Wages 45s. a week.
Apply, by letter, to the MANAGER, Gas-Works, COVENTRY.

WANTED, for a Country Works, two reliable RETORT-HOUSE FOREMEN.
Apply by letter, giving References, stating Experience and Wages required, to No. 3874, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Man used to Works Fitting, and able to do Smith's Work on Small Works near London.
Apply, by letter, to No. 3869, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

RETORT HOUSE Foreman Wanted. Must be a good Carbonizer, and able to take place at change. One able to do Retort-House Fitting preferred. Hislop's Settings.
Apply, by letter, to No. 3870, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Man to act as CLERK OF WORKS during erection of a Bench of Retorts on the Generator Principle. None but those who have had practical experience need apply.
Write giving References, and stating Terms required, to No. 3876, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Manager for a large Tar- Works, who has held a similar situation. Must be a steady sober Man, and well up in the manufacture of Benzols, Carbolic, Refined Naphtha ine, &c.
Apply, by letter, stating Experience, Age, and Salary, with *copies* of Testimonials, to 3873, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, for Cape Town, competent MAIN and SERVICE LAYERS, who are also used to Fitting. Salary £3 per week; Passage paid. Single Men wanted.
Applications, with full Particulars and Testimonials, should be addressed to H. YUILL, Cape Town Gas Company, Limited, 35, New Broad Street, LONDON, E.C.

REQUIRED, at once, a Junior Clerk for a Well-Established Gas Company in one of the Northern States of Brazil. Age about 21. Three years' Engagement. Passage out and home free.
Apply, by letter only, in the first instance, stating Qualifications, Salary expected, and Employment for last Three Years, and enclosing *copies only* of Three recent Testimonials, to No. 3875, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF BIRMINGHAM.
(GAS DEPARTMENT.)

THE Gas Committee invite applications for the position of WORKS ENGINEER of their Windsor Street Works. Candidates must not be less than 30 Years of age, or more than 45, and must be thoroughly acquainted with modern methods of Gas Manufacture, including Carburetted Water Gas and the working of Inclined Retorts. A knowledge of Distribution and the Construction of Gas-Meters is desirable, and Candidates must also have had experience in designing and carrying out up-to-date Gas-Works Plant.
Commencing Salary, £600 per annum.
Applications must be submitted by the 30th of June inst., giving full particulars of Age and Experience, with Testimonials and References, addressed to the Chairman of the Gas Committee, Council House, Birmingham, and endorsed "Application — Works Engineer."

G. HAMPTON BARBER,
Secretary.

CARBON for Sale—About 5 Tons. Offers wanted, stating Price per Ton on Rail at Yarm.
S. J. HARLOW, Manager, Gas-Works, Yarm, YORKSHIRE.

SPENT OXIDE FOR SALE.

A QUANTITY of Spent Oxide for Sale from 10 Tons upwards.
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CONDENSER for Sale—Morris and CUTLER'S "PERFECT;" capacity 250,000 cubic feet per 24 hours. In perfect condition. New in 1888, and recently retubed.
Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

FOR SALE—Six Egg-ended Boilers, each 35 ft. by 5 ft. diameter. Hold about 4000 gallons each; for Tar or Liquor. £23 each on rail.
Also COLUMNS and ROLLED JOISTS forming staging for Purifiers. Area 75 ft. by 65 ft. 12 ft. 6 in. from floor to top of Joists. Columns 15 inches diameter. Rolled joists 18 in. by 7 in., and 14 in. by 6 in. Stone Bases, if required, 38 in. by 38 in. by 24 in. All cheap.
Apply, by letter, to No. 3865, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

FOR SALE—Two Steam-Boilers, 18 feet long by 6 feet diameter, each with two flues. Made by Galloway. In good condition, with mountings complete.
Apply to H. SMYTHE, Gas-Works, MAIDSTONE.

FOR SALE—Gasholder, 20 ft. diameter, 10 ft. Lift. Complete with Standards, &c. Suitable for Brick Tank. Can be seen in sections near London. A Bargain.
Apply BILBIE, HOBSON, & Co., 80, QUEEN VICTORIA STREET, E.C.

CARBON for Sale—about 150 Tons. 50 Tons at Nine Elms Station, 20 Tons in Hampshire, 10 Tons in Yorkshire, 14 Tons in Northampton, and 20 Tons in Kent.
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GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill DEWSBURY.

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FOR IMMEDIATE SALE.

A TWO-LIFT Gasholder in good con- dition. Working capacity 25,500 cubic feet. Diameter of Outer Lift, 35 ft. by 14 ft. deep. Six Cast-Iron Columns.
Price to include taking down and removal.
Apply to MANAGER, Gas-Works, Nantwich, CHESHIRE.

CHESTER UNITED GAS COMPANY.

FOR SALE—40,000 per hour Recipro- cating EXHAUSTER and ENGINE by R. Dempster and Sons, in first-class working condition. Discarded to make room for larger one. Can be seen by appointment, or Photo. sent.
Apply to J. C. BELTON, Engineer, Gas-Works, CHESTER.

TO BE SOLD—
GASHOLDER, 14 ft. by 10 ft. with 3 Columns and Suspension.
GASHOLDER, 16 ft. by 10 ft. with 4 Columns.
GASHOLDER, 20 ft. by 10 ft. with 4 Columns and Suspension.
GASHOLDER, 30 ft. by 12 ft. with 4 Columns.
GASHOLDER, 43 ft. by 14 ft. with 5 Columns and Suspension.
GASHOLDER, 45 ft. by 14 ft. with 5 Columns and Two Lifts.
GASHOLDER, 80 ft. by 20 ft. with 10 Columns Two Lifts
Write J. WRIGHT, 181, Queen Victoria Street, E.C.

SEAFORD GAS COMPANY.
TENDERS FOR GAS COAL.

THE Directors of the Seaford Gas Com- pany invite TENDERS for the supply of 1000 Tons (more or less) of GAS COAL, delivered free at Seaford Station in quantities of not less than Ten Trucks as required during the Twelve Months ending June 30, 1903.
Tenders to be sent in not later than June 26.

JAMES COWNEY,
Secretary.

Gas Offices, Seaford.

WINSFORD URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE above Council are prepared to re- ceive TENDERS for the supply, delivery, and fixing of NEW PLANT at their Works.
Specifications and Form of Tender may be obtained upon application to Mr. F. Sidwell, Manager, Gas-Works, Winsford.
Tenders, endorsed "Gas Improvements," to be delivered to the undersigned on or before the 17th inst.
The Council do not bind themselves to accept the lowest or any Tender.

JNO. H. COOKE,
Clerk to the Council.

Council Offices, Russell Street,
Winsford, Cheshire, June 3, 1902.

URBAN DISTRICT COUNCIL OF WINSFORD.

THE above Council are prepared to receive TENDERS for the supply of CANNEL and Best Screened GAS COAL, to be delivered at the Cheshire Lines Station, Winsford, or the Over and Wharton Station of the L. & N.W. Ry., or at the Council's Wharf on the River Weaver at Winsford. The material is required for a term of Nine Months from the 1st day of October, 1902.
The probable quantities required will be about 200 Tons of Cannel, and about 1000 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites and other Objectionable Matter; but the Council reserve the right of reasonably increasing or decreasing the quantities named.
The person whose Tender is accepted will be required to enter into an Agreement with the Council for the due performance of the Contract.
Sealed Tenders, stating price per ton, delivered as above, are to be received by the undersigned on or before the 17th day of June, 1902, and endorsed "Gas Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender and further Particulars may be had on application to the Gas Manager, F. Sidwell, Winsford, or from

JNO. H. COOKE,
Clerk to the Council,

Council Offices, Russell Street,
Winsford, Cheshire,
June 3, 1902.

SUTTON, SOUTHCOATES, AND DRYPOOL GAS COMPANY, HULL.
SULPHURIC ACID.

THE Directors are prepared to receive TENDERS for the supply of SULPHURIC ACID, suitable for the manufacture of Sulphate of Ammonia, for a period of One Year from the 1st of July, 1902, delivered in Hull in the senders' carboys.
Tenders, addressed to the undersigned, to be delivered, endorsed "Tender for Sulphuric Acid," not later than noon on Wednesday, June 18.
The Directors do not bind themselves to accept the lowest or any Tender.
Further Particulars may be obtained on application.

By order,
DAVID WOOD,
Secretary.

Gas Offices: St Mark's Street, Hull.
May 30, 1902.

THE Directors of the Sutton, South- coates, and Drypool Gas Company, Hull, invite TENDERS for the Purchase of the surplus TAR produced at their Works during the Twelve Months ending the 30th of June, 1903. Probable quantity, 1100 Tons.
Tenders, addressed to the undersigned, to be delivered, marked "Tender for Tar," before noon on Wednesday, the 18th of June, 1902.
The highest or any Tender not necessarily accepted.

By order,
DAVID WOOD,
Secretary.

Gas Offices: St. Mark's Street, Hull,
May 30, 1902.

THE Directors of the Sutton South- coates and Drypool Gas Company, Hull, invite TENDERS for the supply of 16,000 Tons of Best Silkstone GAS COAL, stating price per ton for each of the following descriptions—Screened, Unscreened, and Cobbles—for delivery during the Year ending the 31st of May, 1903, in North-Eastern Railway Company's Waggons into this Company's Siding, Dansom Lane, Hull.
The lowest or any Tender will not necessarily be accepted.
Tenders to be sent, addressed to the undersigned, before Twelve o'clock noon, on Wednesday, the 18th of June, 1902, marked "Tender for Coal."

By order,
DAVID WOOD,
Secretary.

Offices: St. Mark's Street, Hull,
May 30, 1902.

URBAN DISTRICT COUNCIL OF LYMM.

THE above Council are prepared to re- ceive TENDERS for the supply of CANNEL and best screened GAS COAL, to be delivered at their Gas-Works in Lymm, for a term of Twelve Months from the 1st day of July, 1902.
The probable quantities required will be about 120 Tons of Cannel and about 1700 Tons of Gas Coal, which must be freshly wrought, well screened, and free from Sulphurous Pyrites, and other objectionable matter; but the Council reserve the right of increasing or decreasing the quantities named.
The person whose Tender is accepted will be required to enter into an agreement with the Council for the due performance of his Contract.
Sealed Tenders, stating price per ton delivered alongside the Works, to be sent to the undersigned on or before the 18th day of June, 1902, and endorsed "Coal Tender."
The Council do not bind themselves to accept the lowest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD,
Clerk.

Council Offices, Lymm,
Cheshire, June 2, 1902.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Urban District Council are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR made at their Gas-Works, for a term of One Year from the 1st day of July, 1902 (or for such longer term as may be contracted for with the consent of the Council).
Tar and Liquor will be delivered free into Contractor's boat on the Bridgwater Canal.
Tenders to be sent to the undersigned on or before the 18th day of June, 1902, endorsed "Tar."
The purchaser will be required to enter into an agreement with the Council for the due performance of his Contract.
The Council do not bind themselves to accept the highest or any Tender.
Forms of Tender are not supplied.
Further Particulars may be had on application to the Gas Manager, Mr. W. L. Donaldson.

W. MULLARD
Clerk.

Council Offices, Lymm, Cheshire.
June 2, 1902.

KNARESBOROUGH URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

THE Gas Committee of the above Council invite TENDERS for the supply of about 1900 Tons of best screened GAS COAL, to be delivered at the Knaresborough Station during the Twelve Months following the 1st of August next, in such quantities as the Committee may require.
The Committee do not bind themselves to accept the lowest or any Tender.
They also invite TENDERS for the supply of about 90 Tons of PURIFYING LIME, and for the purchase of their surplus TAR and LIQUOR made during the same period.
Sealed and endorsed Tenders to be addressed to the undersigned on or before the 14th day of June.

THOMAS MAINMAN,
Clerk to the Council.

THE Haworth Urban District Council invite TENDERS for the supply of 2500 Tons of GAS COAL, screened and unscreened, in such proportion as the Council may determine, delivered at Haworth Station during the ensuing Twelve Months.

Tenders to be sent to me, the undersigned, not later than the 25th inst.

WM. ROBERTSHAW,
Clerk.

Haworth Urban District Council,
North Street,
Keighley.

THE Directors of the Keswick Gas Company invite TENDERS for their surplus TAR and AMMONIACAL LIQUOR, for Twelve Months from the 30th inst., at per ton, delivered into Contractors' low square Tanks at Keswick Railway Station.

Sealed Tenders, endorsed "Tender for Tar" or "Liquor," will be received by the undersigned on or before the 18th inst.; but the Directors do not bind themselves to accept the highest or any Tender.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
Cumberland, June 1, 1902.

THE Directors of the Keswick Gas Company invite TENDERS for the supply of 2000 Tons of best screened GAS COAL or NUTS, to be delivered at Keswick Railway Station between the 1st of July, 1902, and the 30th of June, 1903, in such quantities and at such times as may be required.

Tenders, endorsed "Tender for Coal," to be sent to the undersigned not later than the 18th inst.

No Form of Tender supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

J. H. BRODIE,
Secretary.

Main Street, Keswick,
Cumberland, June 1, 1902.

BUXTON URBAN DISTRICT COUNCIL.

TENDERS FOR CANNEL.

THE Gas Committee invite Tenders for the supply of 3000 Tons of CANNEL, to be delivered at their Siding, on the Midland Railway, in Ashwood Dale, Buxton, during the Year ending the 30th of June, 1903.

Forms of Tender and other Particulars may be obtained of Mr. H. Barker, Engineer, Town Hall, Buxton.

Sealed Tenders, endorsed "Tenders for Cannel," to be addressed to the Chairman of the Gas Committee, and delivered not later than Saturday, June 14.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
JOSIAH TAYLOR,
Clerk.

BUXTON URBAN DISTRICT COUNCIL.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee invite Tenders for the purchase of the surplus TAR and LIQUOR produced at their Works in Ashwood Dale, Buxton, for One Year commencing from the 30th of June next.

Forms of Tender and other Particulars may be obtained of Mr. H. Barker, Engineer, Town Hall, Buxton.

Sealed Tenders, endorsed "Tenders for Tar and Liquor," to be addressed to the Chairman of the Gas Committee, and delivered not later than Saturday, June 14, 1902.

The Committee do not bind themselves to accept the highest or any Tender.

By order,
JOSIAH TAYLOR,
Clerk.

CORPORATION OF NOTTINGHAM.

(GAS DEPARTMENT.)

TENDERS FOR COALS.

THE Gas Committee are desirous to receive OFFERS for supplies of COALS, COBBLES, or NUTS for the period terminating the 30th of June, 1903.

The large Coals and the Cobbles or Nuts are to be separately delivered, where and as from time to time directed, by, and at the expense of, the Contractors, upon the Gas-Works Siding, Great Northern Railway, in the East Croft at Nottingham, and also on the Gas-Works Sidings, Midland Railway, at Radford and Basford respectively; and at and after the rate of one-eighth part of such total quantity in each calendar month, commencing with the month of July next, till the Corporation shall be satisfied with the amount of accumulated Stock, and afterwards at such rate as shall be from time to time directed, till the agreed quantity shall have been delivered.

The Coals, Cobbles, or Nuts are to be the best of their respective kinds, freshly wrought and WELL SCREENED (description, sizes, and inclination of screen to be specified), to be as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the Ton) upon the Corporation machines, or upon such other Machines as may be mutually agreed upon.

Payments will be made monthly, if and so long as the contract shall be duly fulfilled.

The Corporation do not bind themselves to accept the lowest or any Tender.

Further Information and Forms on which the Tenders must be made, may be obtained on application at the General Manager's Office; and the Tenders (sealed), specifying the description of Coals, the Seam, and the Pits at which they are to be raised, and stating the prices for deliveries at the several places and in manner and subject to the conditions aforesaid, must be delivered to SIR SAMUEL GEORGE JOHNSON, KT., Town Clerk, by first post Monday, the 16th day of June, 1902.

By Order,
THE GAS COMMITTEE.

Corporation Gas Offices, George Street,
Nottingham, June 5, 1902.

HARLOW AND SAWBRIDGEWORTH GASLIGHT AND COKE COMPANY, LIMITED.

TENDERS are invited for the supply of 1400 Tons of best GAS COAL, delivered free at Harlow Station in such quantities monthly as may be required between July 1, 1902, and June 30, 1903.

No special Form of Tender provided.

Tenders to be endorsed "Tender for Coal," giving full Particulars of the Coal offered, to be sent to me on or before June 19.

E. F. PARKER,
Secretary and Manager.

Harlow.

GLASGOW CORPORATION.

(GAS DEPARTMENT.)

THE Corporation invite Tenders for the supply and erection of three STATION METERS required for their Provan Gas-Works.

Drawings may be seen and Specification and Form of Tender may be obtained on application to Mr. W. Foulis, Gas Engineer, 45, John Street, Glasgow.

Sealed offers, marked "Gas Department, Tender for Station Meters," and addressed to the subscriber, will be received by him on or before Tuesday, the 24th curt.

The Corporation do not bind themselves to accept the lowest or any Offer.

J. D. MARWICK,
Town Clerk.

City Chambers, Glasgow,
June 6, 1902.

WORKSOP GAS COMPANY.

THE Directors of the Worksop Gas Company are prepared to receive TENDERS for the supply of 4500 Tons of the best screened GAS COAL, to be delivered at Worksop Station during the Year ending July 31, 1903. To be as free as possible from Sulphur, Bats, Bind, Refuse, and Dirt, and shall be weighed (20 cwt. to the ton) on the Company's Machine.

Tenders to be sent in to the undersigned on or before the 21st of June, 1902.

The Directors reserve to themselves the right to accept Tenders for the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

F. KENT,
Manager.

June 3, 1902.

GUILDFORD GASLIGHT AND COKE COMPANY.

TO COAL MERCHANTS.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 5000 to 6000 Tons of DURHAM GAS COAL, to be delivered free at Guildford Station between the 1st of July, 1902, and the 31st of March, 1903, in such quantities and at such times as required.

The Directors reserve the right to accept the whole or any portion of the quantity offered, and do not bind themselves to accept the lowest or any Tender.

Tenders, to be endorsed "Tender for Coal," and to be sent to David Williamson, Esq., Chairman of the Gas Company, on or before Tuesday, the 24th of June, 1902.

By order,
WILLIAM TITLEY,
Secretary.

Gas Offices, Guildford,
June 6, 1902.

BOROUGH OF SAFFRON WALDEN.

TENDERS FOR COAL.

THE Gas and Water Undertaking Committees of the Town Council are prepared to receive TENDERS for the supply of about 1300 Tons of best screened GAS COAL and about 220 Tons of best Hand-picked HARD STEAM COAL, respectively, for the Twelve Months ending the 30th of June, 1903.

Full Particulars can be obtained on application to Mr. A. H. Forbes, Borough Surveyor.

Sealed Tenders, endorsed "Tender for Gas Coal," or "Tender for Steam Coal," as the case may be, to be addressed and sent to me, the undersigned, not later than Five o'clock in the afternoon, on Monday the 23rd day of June inst.

The lowest or any Tender will not necessarily be accepted.

W. ADAMS,
Town Clerk.

Saffron Walden,
June 6, 1902.

MANSFIELD CORPORATION.

(GAS DEPARTMENT.)

TENDERS FOR GAS COAL AND CANNEL.
TENDERS FOR TAR AND AMMONIACAL LIQUOR.

COAL.

THE Gas Committee are prepared to receive TENDERS for 2000 Tons of CANNEL and 9000 Tons of best screened GAS COAL, delivered at Mansfield Station, for One Year from the 1st of July, 1902, to the 31st of June, 1903.

TAR AND LIQUOR.

TENDERS for surplus TAR and LIQUOR made during the Year, from the 1st of July, 1902, to the 30th of June, 1903. Tenders for Liquor to be made either at a fixed price per Ton or on the Sliding-Scale regulated by the price of Sulphate.

Tenders, endorsed "Coals," to be sent to J. Harrop White, Esq., Town Clerk, Mansfield, on or before the 24th of June, 1902.

Particulars and all other Information from the undersigned.

No special Form of Tender provided.

The Committee do not bind themselves to accept the lowest or any Tender.

ARTHUR GRAHAM,
Engineer and Manager.

Gas-Works, Mansfield,
June 3, 1902.

TENDERS FOR GAS COAL.

THE Spalding Urban District Council invite TENDERS for the supply of from 3000 to 4000 Tons of best GAS COAL or NUTS, to be delivered free on board in the Tyne or at the Gas-Works, Spalding, in such quantities and at such times as shall from time to time be required from October, 1902, to October, 1903.

The Council do not bind themselves to accept the lowest or any other Tender.

Tenders, endorsed "Tenders for Coal," are to be sent to me on or before Tuesday, the 17th of June inst.

No Form of Tender supplied.

H. H. HARVEY,
Clerk to Spalding Urban
District Council.

June 5, 1902.

URBAN DISTRICT COUNCIL OF MORECAMBE.

(GAS DEPARTMENT.)

TENDERS FOR COAL.

THE Gas Committee of the above are prepared to receive TENDERS for the supply of 5000 Tons of GAS COAL, to be delivered on the Gas-Works Siding, Midland Railway, Morecambe, in such quantities as may be required by the Engineer.

Tenders specifying the description of Coal, the name of the Pit at which it is raised, and the terms for Net Monthly Payments, are to be sent in on or before Wednesday, the 2nd of July, 1902, endorsed "Tenders for Coal."

The Gas Committee do not bind themselves to accept the lowest or any Tender.

JAMES R. DUFF,
Engineer and Manager.

Market Street, Morecambe,
June 3, 1902.

BOROUGH OF LEIGH.

(GAS AND WATER DEPARTMENTS.)

THE Gas and Water Committee of the above Corporation are prepared to receive TENDERS for the supply of the following goods:—

1. 12,500 Tons of screened ARLEY GAS COAL.
2. 1800 Tons of CANNEL.
3. WROUGHT-IRON TUBES and FITTINGS.
4. CAST-IRON PIPES and SPECIALS.
5. LEAD PIPE.
6. GAS-METERS.
7. VITRIOL.
8. LIME.

Forms of Tender and further Particulars may be obtained on application to Mr. J. Foster, Gas and Water Manager, Leigh.

Sealed and endorsed Tenders must be delivered to the undersigned on or before Twelve o'clock noon, on Saturday, the 21st day of June next.

The Corporation do not bind themselves to accept the lowest or any Tender; and reserve to themselves the right to divide any Tender.

By order,
PEREGRINE THOMAS,
Town Clerk.

Town Hall, Leigh, Lancs.,
June 3, 1902

SOWERBY BRIDGE URBAN DISTRICT COUNCIL.

TO BUILDERS AND IRONWORK CONTRACTORS.

THE Gas Committee invite Tenders for the IRONWORK required in the erection of OXIDE FLOOR and STEEL SUPERSTRUCTURE; also for CONCRETE RETAINING WALL, BOUNDARY WALL, FOUNDATION for Columns, forming Concrete OXIDE-FLOOR, &c., in connection with proposed Extensions at the Gas-Works, Sowerby Bridge.

Drawings and Specifications can be seen and copied, and Forms of Tender and all Information obtained upon application to Mr. A. W. Bissell, Engineer, Gas-Works, Sowerby Bridge.

The Gas Committee do not bind themselves to accept the lowest or any Tender.

Tenders must be in the hands of the under-mentioned not later than Twelve o'clock on Monday, June 23, 1902, endorsed "Tender for Ironwork" or "Brickwork," as the case may be.

R. W. EVANS,
Clerk to the Council.

Commercial Bank Chambers,
Halifax, June 5, 1902.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the following:—

1.—GAS COAL.

The supply of best screened COAL or NUTS for Gas-Making Purposes, to be delivered in Senders' or Railway Company's Trucks at Brunswick Wharf, Congleton, N.S.R., during the Twelve Months ending June 30, 1903.

Forms of Tender and Conditions may be obtained from the undersigned.

2.—TAR and AMMONIACAL LIQUOR.

The purchase of surplus TAR and AMMONIACAL LIQUOR, which will be produced during the Twelve Months ending June 30, 1903.

Form of Tender and Conditions may be obtained from the undersigned.

3.—LIME.

The supply of about 150 Tons of best Hand-Picked LIME for Purifying Purposes, to be delivered in Senders' or Railway Company's Trucks at Brunswick Wharf, Congleton, N.S.R., in such Quantities and at such times as may be required during the Twelve Months ending June 30, 1903.

No special Form required.

Tenders, endorsed "Coal" "Tar" and "Lime," respectively, to be delivered at the Office of E. A. Plant, Esq., Town Clerk, Congleton, on or before Saturday, the 21st day of June, 1902.

The Committee do not bind themselves to accept the lowest or any Tender.

JAMES SMITH,
Manager

Gas-Works, Congleton,
June 4, 1902.